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THE EPIDEMIOLOGY OF TUBERCULOSIS*

BY

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The earliest observation on the contagious nature of tuberculosis occurs in the Ordinances of Manu in India, thirteen centuries B.C. In these, pulmonary consumption and swelling of the glands of the neck are declared to be unclean, incurable diseases. Those who wanted to marry are cautioned not to select a spouse from a consumptive family even though the family had a good lineage and possessed great wealth. These laws show a knowledge of tuberculosis, and as the disease was regarded as an impediment to marriage it seems likely that it was regarded as contagious. In Europe the earliest reference to the contagious nature of tuberculosis was made by the Greek orator Isocrates in his *Aegineticus* (§ 29), written about 390 B.C. In this he states: "The majority of those who had nursed this disease [phthisis] had themselves fallen victims to it." The Hippocratic school, however, did not generally subscribe to this view, preferring the idea of the tuberculous diathesis which has persisted even to the present day. About one hundred years later Aristotle realized that consumption could be spread by close contact with the diseased person. Galen and Avicenna held similar views. It is more than a tragedy that these early Greek observations were disregarded and forgotten in later centuries, for it was only towards the end of the seventeenth century that in Latin countries such as Spain and Italy the contagious nature of the disease was again being recognized. In Britain, Edward Mainwaring was possibly the first to assert that tuberculosis was spread by contact, as in 1667 he wrote: "You must not frequently converse with a phthisical person whose unwholesome breath may infect the sound by drawing in putrid vapours which the other breathes forth, but above all a phthisical bedfellow is most dangerous to affect a sound person and chiefly to be avoided."

Later, in 1694, Richard Morton in his book *Phthisiologia*, which is an outstanding presentation of the symptomatology of tuberculosis, wrote: "A contagious principle also propagates the disease, for, as I have found by experience, an affected person may poison a bedfellow by a kind of miasm like that of a malignant fever." Towards the middle of the nineteenth century, however, leaders of the profession like Bright and Addison (1839), also Graves (1843), almost completely disregarded the contagiousness of tuberculosis, and attached great importance to diathesis. This unparalleled reverence for the past with its diathesis had so dominated men's minds that little or no progress had been made for centuries regarding the true nature of the disease. Laennec (1826), though he unified the whole concept of tuberculosis by asserting that wherever tubercles occurred the disease was tuberculosis, was of the opinion that at least in France tuberculosis was not usually contagious. That tuberculosis could be produced in animals by inoculation with tuberculous material was shown in 1843 by Klencke, and in 1868 Villemin finally proved experimentally that tuberculosis was an infectious disease. It was Villemin who first showed that tuberculous material from bovine sources was more virulent for rabbits than that from human. In 1867 William Budd, of North Tawton, as a result of a study of the geographical distribution of consumption in past and present times, concluded: "The tuberculous matter itself is (or includes) the specific matter of the disease and constitutes the material by which phthisis is propagated from one person to another and disseminated throughout society." Even after the discovery of the tubercle bacillus by Koch in 1882 we find from the Collective Investigation Record (British Medical Association, 1883) that many British physicians reported that they had never observed a case of probable transmission of the disease from a case of phthisis. Later, Theobald Smith (1896, 1898) reported the existence of "a distinctively human or sputum, and a bovine variety of tubercle bacillus."

Though Koch proved that the tubercle bacillus was the *causa peccans* and stressed the importance of inhalation of infected sputum in the spread of the disease, it is strange how in 1901, while accepting that human and bovine types were different, he yet concluded that the latter was rarely pathogenic for man. Koch (1882) had undoubtedly found the bovine bacillus in human disease, for he had obtained from a case of caseous pneumonia (No. 27) a culture of tubercle bacilli which after inoculation into the anterior chamber of the eye proved virulent for rabbits. In 1911 the British Royal Commission proved conclusively that the bovine bacillus was a definite cause of tuberculosis in man. It is not surprising that Koch went astray when we consider the relative rarity of primary abdominal tuberculosis in Germany as compared with this country. Indeed, Koch himself in his address gave post-mortem statistics from various German sources to support the rarity of this condition. At a later date Ghon and Kudlich (1930) found in 2,114 cases of tuberculosis in children in Central Europe a primary intestinal infection in only 24 (1.14%) and tonsils infection in 2 (0.09%).

Cycle of Infection in Human and Bovine Tuberculosis

The two chief varieties of tubercle bacilli to be considered are the human and the bovine types, as they are almost solely responsible for disease in man and in animals.

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The avian may be dismissed, owing to the rarity of this type of infection in the human subject (Gloyne, 1933; Feldman, 1938; Bradbury and Young, 1946). The human type passes from man to man, more often by droplet infection than through the agency of dried sputum.

Infection with the bovine type is found chiefly in cattle, though many other types of animals and also man are liable to be infected. The chief mode of spread in cattle is by droplet infection, and thus, as in man, the primary lesion is most often in the lungs. Man is infected with bovine bacilli chiefly through the ingestion of contaminated milk, though air-borne infection is also possible, as is well exemplified in the cases of bovine conjunctival tuberculosis in milkers reported by Jensen *et al.* (1940). The cycle of infection, however, does not stop there (Fig. 1), as it has

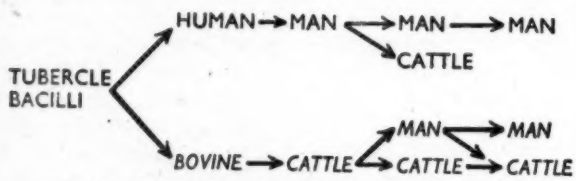

FIG. 1.—The cycle of infection in man and in animal.

been observed that bovine infection may pass back from man to cattle (Magnusson, 1941, 1942; Griffith and Munro, 1944; Plum, 1940; Nielsen and Plum, 1939; Tice, 1944), and also from man to man, as in the five proved cases reported by Griffith and Munro (1935), Munro (1939), Jensen *et al.* (1940), and Hedvall (1942).

The human type of tubercle bacillus may also infect cattle, as it has been observed that cows in contact with a human case of pulmonary tuberculosis, though developing no sign of active disease, may give positive tuberculin reactions. Many of these cases have been proved by the isolation of a human type of bacillus from the tissues of cattle which may show no active disease or minimal lesions in either the respiratory or the alimentary system (Giltner, 1923; Hindersson, 1933; Stenius, 1933; Bang and Jepsen, 1936; Crawford, M. (personal communication), 1936; Plum, 1937; Van der Schaaf and Van Zweiten, 1939; Reid, 1939; Plum, 1940; Nielson and Plum, 1939; Feldman and Moses, 1941; Hillermark, 1942; Rosa, 1942; Magnusson, 1942). Neither Hindersson (1933) nor Plum (1936, 1937) succeeded in isolating human tubercle bacilli from the milk of cows naturally or experimentally infected with the human type. Thus infection of cattle with the human type is more of a nuisance, as it results in confusion at tuberculin-testing: bovine infection, on the other hand, usually gives rise to serious losses. Someone in contact with a previously clean herd should be suspected when many positive reactors suddenly appear at routine tuberculin-testing.

The cycle of infection in man and in animals is thus much more complicated than originally suspected.

A. Infection with the Human Type of Bacillus

1. Respiratory

The chief pathway of infection for tuberculosis in the human subject is via the respiratory system. In a consecutive post-mortem series of 434 cases of tuberculosis in children under 13 years the primary site of infection was found in the respiratory system in 283 (65.2%), in the abdomen in 140 (32.3%), and in the cervical glands in 9 (2.07%); no definite primary portal of infection could be identified in 7. (In 5 of the cases there appeared to be double sites of entry—one in the thorax and the other in the abdomen.)

Respiratory tuberculosis is most commonly caused by the inhalation of infected droplets; occasionally, however, pulmonary tuberculosis may be secondary to tuberculosis elsewhere, as, for example, in the mesenteric or cervical glands, due usually to blood spread from these sites. Tubercle bacilli must, however, be frequently inhaled without producing any recognizable lesion, and it must be assumed that in these cases the tubercle bacilli are destroyed by the resistance of the tissues of the healthy individual. It is thus not the bacillus itself, the presence of which is essential, but the harmonious working together of many factors which results in disease. These factors probably play a more important part in the pathogenesis of the disease than the organism, but the true nature of many of them and their mode of action is still obscure. Tuberculosis is a universal disease and the chances of infection are enormous, and it is a native or acquired resistance, or both, which prevents the disease assuming epidemic proportions. Is this resistance humoral or cellular? It would appear to be more associated with the latter, as Lurie (1942) has shown experimentally that tubercle bacilli phagocytosed by the mononuclear leucocytes of normal animals are not killed, whereas the same cells in actively tuberculous or immune animals have increased bacteriostatic or bactericidal properties which seem to be independent of the body fluids, as these properties remain after the cells have been transferred into a normal animal.

In a series of cases of primary respiratory tuberculosis in children under 13 years we isolated the human type of bacillus from the primary lung lesion or the tracheobronchial glands in 160 (96.4%) and the bovine in 6

TABLE I.—*Primary Respiratory Tuberculosis; Types of Tubercle Bacilli*

Type	0–1 year	1–2 years	2–3 years	3–6 years	6–13 years	Total
Human ..	58	31	21	24	26	160 (96·4%)
Bovine ..	*1*	*2*	*2*	*1*	—	*6 (3·6%)*

(Table I). Griffith and Munro (1944) in figures collected from various authors found that the types of tubercle bacilli occurring in the sputum of Scottish patients with pulmonary tuberculosis comprised 2,609 (94.3%) human and 160 bovine strains, and from cases in England, Wales, and Eire 4,113 (98.1%) human and 81 bovine.

In most cases of human infection in childhood the source of infection is usually a near relative, and in a recent series of cases of meningitis of all ages due to the human type of bacillus investigated in Scotland the mother was the most frequent source (Table II). The significance of this familial

TABLE II.—*Relationship of Contact to 144 Cases of Meningitis Infected with Human Strains*

Mother ..	44	Brother ..	20	Grandmother ..	2
Father ..	22	Aunt ..	12	Grandfather ..	6
Sister ..	21	Uncle ..	6	Others ..	11

infection is important, as it subjects those coming in contact with it to repeated infections, and also to the liability of massive doses of tubercle bacilli. Both these factors may overcome any natural or acquired resistance possessed by a member of a family, more particularly should this resistance be lowered by acute disease, overwork, or malnutrition.

In childhood the primary infection results in the primary lung lesion, originally described by Parrot (1876) though often credited to Ghon (1916). It may also occur in adults, and during the war period we observed typical childhood acute primary pulmonary lesions more often in the adult than formerly, due, I think, to the greater number of rural dwellers coming to work in factories in urban areas. The primary lung lesion in the child is usually small and may

be readily missed unless carefully searched for at necropsy (Blacklock, 1932). It is usually single, but why this should be so in view of the probability of multiple infections—as, for example, in the case of a child with a tuberculous parent—is unknown. The secondary lesion in the tracheo-bronchial glands in the child under 3 years is usually massive. The reason for the greater size of the lesion in the glands as compared with that in the lungs would appear to depend on the degree of hypersensitivity which the child has developed in the interval elapsing between the occurrence of the lesion in the lung and that in the glands. Owing to this hypersensitivity the lesion in the glands is more of an exudative type, and thus massive caseation occurs. In the older child the degree of tuberculosis in the tracheo-bronchial glands is usually less than that in the younger; in fact in older children and adults the glandular lesion may be entirely absent. Terplan (1946) has also noted this. In post-mortem examinations in adults small healed primary lung lesions are often found, and in a series of cases still being studied in the Royal Infirmary, Glasgow, only about 5% show any evidence of tuberculosis in the tracheo-bronchial glands. This relative absence of secondary lesions in the glands of older children may be partly accounted for by the more frequent evidence of healing as judged by the growth of fibrous tissue around the primary lung lesion. This fibrosis increases *pari passu* with age (Table III), and will close lymphatic channels

TABLE III.—*Primary Lung Foci in Children: Evidence of Healing*

Age	No. of Foci	Percentage Healing
0- 6 months	40	0
6-12 ,, ...	58	10·3
1- 2 years	62	37·1
2- 3 ,, ...	40	40·0
3- 6 ,, ...	44	52·2
6-13 ,, ...	46	67·4

and thus prevent the spread of the bacilli to the glands. This, however, is not the primary reason, for it is obvious that in order to allow granulation tissue to form and subsequent fibrosis to occur the bacilli must be fixed at the site of infection and prevented from undue multiplication, at least for a time, by some bodily defensive mechanism.

Age is undoubtedly an important factor in determining healing. The longer the primary infection in the child is delayed the greater chance of resolution, particularly in the period between 5 and puberty, but why this should be so is unknown. This probably accounts for the higher mortality in children of the hospital class as compared with those who are better off. In the former there are more opportunities of infection occurring in early life, due largely to the overcrowded conditions under which most of them live, than in the latter, in whom primary infection is usually delayed until school age or later. A further and an important factor is that between 5 and 14 years there is a greater proportion of changes from a positive to a negative tuberculin reaction than at any other age (Zacks and Sartwell, 1942).

If the disease is not localized at or near the site of infection then, in the child, generalization occurs, resulting in acute generalized miliary tuberculosis with or without meningitis. The total human percentage for the latter in Scotland was 82.8 as reported by various workers between 1907 and 1947 (Watt, 1907; Wang, 1916–17; Blacklock, 1932; Griffith, 1934; Blacklock and Griffin, 1935; Macgregor *et al.*, 1935; Macgregor and Green, 1937; Munro and Scott, 1936; National Investigation (Scotland), 1943–4). The proportion of human infections was higher in the older than in the younger age groups (Table IV). The main portal of entry of human strains is via the lungs,

TABLE IV.—*Types of Tubercle Bacilli: Cerebral Tuberculosis: Scotland*

Date	0–5 years		6–15 years		Over 15 years		Total	
	H.	*B.*	H.	*B.*	H.	*B.*	H.	*B.*
1907–37 ..	178	*72*	71	*19*	30	*6*	281*	*99**
1943–4 ..	193	*42*	153	*15*	152	*5*	498	*62*
Total ..	371	*114*	224	*34*	182	*11*	779	*161*
Human %	76.5		86·8		94·3		82·8	

* Includes 2 cases, ages not stated.

and thus most of these cerebral deaths should be included with tuberculosis of the respiratory system, though by the Registrar-General they are tabulated separately under the heading of "meningeal tuberculosis."

The first infection in the lungs with tubercle is pathologically distinct from all others in that it affects a virgin soil and at its onset is localized. In most cases, particularly in older children and in adults, this localization persists and complete healing results. But the patient has now developed hypersensitivity, the degree of which varies from patient to patient for some years after the initial infection, though it tends to lessen as age advances. For example, in a series of still unpublished Mantoux tests which Griffin and I made in 1932–4 in 1,732 clinically non-tuberculous children, all under 13 years, testing each child first with 0.1 mg. and thereafter, if negative, with 1 mg. and 10 mg. of old tuberculin, we found that of those who did not react to 0.1 mg. the percentage who gave positive reactions with 1 mg. increased as age advanced. The same was true of those who reacted negatively to 1 mg. but positively to 10 mg. (Fig. 2). On account of this waning hypersensitivity in the older as compared with the younger child there is more of a formative response on the part of the fixed tissues, with resulting localization of the infection. The tissue reaction to reinfection tuberculosis, which in the adult is usually exogenous, depends on many factors such as degree of hypersensitivity and of immunity, dose and virulence of the infecting bacilli. Of these various factors hypersensitivity is the most easily investigated in the human subject; the others are difficult. Experimentally infected animals in which hypersensitivity has waned have acquired a high degree of resistance to any subsequent infection (Willis, 1928). The same would appear to be the case in the human subject, for in most adults healed primary lesions, often minute, are found post-mortem. It should be noted, however, that this acquired resistance is by no means absolute and may be broken down by acute and chronic disease, overwork, and malnutrition. A high degree of hypersensitivity is an unfavourable factor as demonstrated in animals by Rich and McCordock (1929) and in tissue cultures by Rich and Lewis (1928). These authors have shown that tubercle bacilli *per se* cause little necrosis in normal tissue, though they quickly do so when hypersensitivity is present.

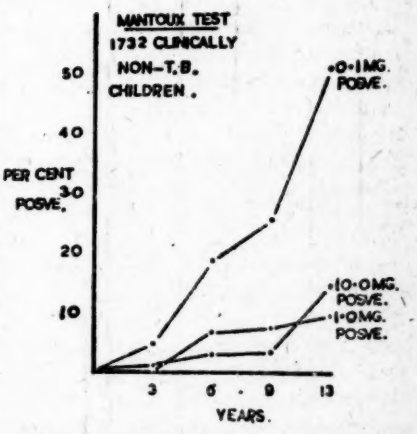

FIG. 2.—Results of a series of Mantoux tests, showing increased percentage of reactions as age advances.

2. Alimentary Infections

Figures for primary abdominal tuberculosis are small. The collected figures from 1914 to 1944 for Scotland (Mitchell, 1914b; Wang, 1916–17; Blacklock, 1932; National Investigation, 1943–4) show a total percentage of human infections of 22.1 (Table V). As most of the abdominal cases were examined post-mortem, care was taken to exclude any source of infection in the lungs from which the abdomen could have been infected. To account for these primary alimentary lesions human tubercle bacilli must have been swallowed in food contaminated by droplet infection or, in the case of young children, by fingers contaminated from floors on which droplets of sputum may have been present. In the case of children between 9 months and 2½ years Dieudonné (1901) recovered tubercle bacilli from the dirt on their hands in 2 of 15 cases. Still another method is through the imperfect cleansing of eating utensils, as has been demonstrated by Hutchinson (1947) for dysentery bacilli, streptococci, and staphylococci.

TABLE V.—*Types of Tubercle Bacilli: Tuberculosis of Abdomen and of Cervical Glands: Scotland*

Site and Date	0–5 years		6–15 years		Over 15 years		Total	
	H.	B.	H.	B.	H.	B.	H.	B.
Abdomen:								
1914–32 ..	10	*51*	3	*10*	2	*2*	15	*63*
1943–4	3	*5*	1	*2*	2	*4*	6	*11*
Total ..	13	*56*	4	*12*	4	*6*	21	*74*
Bovine %	*81·2*		*75·0*		*60·0*		*77·9*	
Cervical glands:								
1914–35 ..	9	*50*	13	*44*	5	*2*	29*	*102**
1943–4	17	*30*	8	*55*	27	*23*	52	*108*
Total ..	26	*80*	21	*99*	32	*25*	81	*210*
Bovine %	*75·5*		*82·5*		*43·9*		*72·2*	

* 2 human and 6 bovine cases included; ages not stated, but under 12 years.

Of the cases of primary tuberculosis of the cervical glands investigated up to 1944 in Scotland (Mitchell, 1914a, 1914b; Griffith, 1915, 1929; Wang, 1916–17; Blacklock, 1932; Griffith and Smith, 1935; National Investigation, 1943–4) the proportion of infections with the human type was 27.8%. The human type of bacillus is thus not mainly responsible for tuberculosis of the abdomen and cervical glands.

B. Infection with the Bovine Type of Bacillus

1. Alimentary

Infection with the bovine type of bacillus is mainly through the alimentary system, and accounts for the greater proportion of cases of cervical gland and abdominal tuberculosis in the various Scottish investigations (Table V). The highest proportion of bovine infections is found in early life, and this is probably due to the greater consumption of milk at that age than at any other. There are thus greater opportunities for infection should the milk contain tubercle bacilli. As the mucosa of the intestine and of the nasopharynx is a less favourable site than the lungs for attack by tubercle bacilli, which grow slowly, some coincidental lesion may probably allow the bacilli to invade these mucosae. The more frequent occurrence of acute catarrhal conditions in these sites in childhood as compared with adults may provide a *locus minoris resistentiae* in which tubercle bacilli may gain a foothold. This may partly account for the greater frequency of tuberculosis of the cervical glands and of the abdomen in children than in adults. Further, the possibility of acquired resistance due to an arrested infection in the lungs may also determine the relative infrequency of alimentary tuberculosis in the adult as compared with the child. This is well exemplified in the case of a phthisical cavity in the adult where, in spite of a sputum containing numerous tubercle bacilli, secondary tuberculous ulcers may not be found in the intestine.

The rural inhabitant is more liable to bovine infection than the urban, as is shown by the greater incidence of bovine infections in cervical adenitis in country (77.8%) than in urban patients (46.2%) (Table VI). The figures for abdominal tuberculosis are too small to be significant for comparative purposes; those for cerebral tuberculosis, however, show a bovine percentage three times higher in rural than in urban cases. More detailed analysis of the figures obtained in the 1943–4 investigation further confirms this higher proportion of bovine infections in rural areas. In tuberculous meningitis 8% were infected with bovine strains in the large burghs and cities of Scotland, as against 15.9% in the rural areas of the counties; in surgical tuberculosis 20.1% of the cases in the burghs and cities were caused by bovine infection; in the rural county areas this percentage was more than double—45.4%. Bovine infection is thus more of a rural than an urban problem. This finding is further substantiated by the figures for the western area of Scotland. In this region 56.7% of the entire population of the country reside, Glasgow accounting for 39.8% of the population of the area. In 1914 there were in this area 3,219 (77.5%) of the 4,138 attested herds in Scotland: in Ayrshire, for example, 88.6% of the dairy herds are attested. This large proportion of attested herds in the western area partly accounts for this region having the lowest bovine percentage of all areas in Scotland in the meningitis series and the second lowest in the surgical series (Table VII). It is not the whole explanation, which is more apparent when the figures for the western area are analysed. In the meningitis cases Glasgow had a bovine percentage of 2.3, the large burghs in the Clyde Valley area had together 8.2, and the rural areas in the Western Counties 10.9. The corresponding bovine percentages in the surgical cases for these places were 8.8, 13.6, and 44.4, respectively. In Glasgow 95% of the milk sold for consumption is subjected to some form of heat treatment (45.9% pasteurized under licence, 49.1% heat treated, and 5% sold as raw milk), and this accounts in part for the very low bovine percentage in the city. In the large burghs the proportion of milk subject to some form of heat treatment is lower than in Glasgow, while in the rural districts of the western area from which Glasgow draws its milk supply any form of heat treatment is practically non-existent. Thus in Glasgow, partly owing to the extensive heat treatment of milk, the mortality rate for bovine meningitis is less than one-quarter and the

TABLE VI.—*Permanent Residence of Patients: 1943–4 Investigation: Scotland*

Site of Disease	Town		Country	
	H.	B.	H.	B.
Abdomen	3	*6 (66·7%)*	3	*5 (62·5%)*
Cervical glands ..	28	*24 (46·2%)*	24	*84 (77·8%)*
Cerebral*	306	*20 (6·1%)*	191	*42 (18·0%)*

* In 1 case residence not stated.

TABLE VII.—*Percentage Bovine Infections: Cerebral and Surgical Tuberculosis: Scotland*

Area	Cerebral	Surgical
Eastern	27·3	54·2
North-eastern	26·7	44·1
South-eastern	13·4	43·7
Northern	8·3	24·0
Western	6·1	27·8

morbidity rate in surgical tuberculosis due to bovine infection is one-fifth of those in the rural areas of the western counties from which it draws its milk supply. Ruys (1946) has made similar observations in Amsterdam, where during the war practically all the milk was pasteurized, and where there was a decrease in bovine tuberculosis in children, though no such decrease was observed in the surrounding rural areas.

Another factor in this difference in the incidence of bovine infection in urban and rural inhabitants which must be considered is an immunological one. Infection with the human type of bacillus must be less common in the country than in the towns, and the rural dweller therefore escapes this type of infection; he consequently develops no tuberculo-immunity, and thus is more liable than the town inhabitant to bovine infection. Indeed, it has been suggested that the presence of bovine bacilli in milk may serve as an immunizing agent in the human subject. This is, however, a dangerous doctrine, for neither the dose nor the virulence of the bacillus is under control, and tuberculous disease, often fatal, may result. For example, applying the bovine percentage—namely, 11.1—which we obtained in Scotland during 1943–4 for meningitis to the 1,033 meningeal deaths recorded for these years by the Registrar-General (Scotland), it can be computed that 115 of these were due to infection with the bovine bacillus. Similarly applying the bovine percentage of 33.8 for surgical tuberculosis obtained in the same investigation to the 20,433 cases of surgical tuberculosis notified in these years, it is estimated that 6,906 of the cases were caused by the bovine bacillus.

Reinfection tuberculosis due to the bovine bacillus is unusual, as it is not common to find post-mortem evidence of fresh infection in cases of tuberculosis of the abdominal or cervical glands when old lesions already exist. This is in marked contrast to the lung, where the finding of a small healed primary focus, usually without glandular involvement and more recent reinfection tuberculosis, is not uncommon. It is worthy of comment, however, that even in healed cervical and abdominal glands viable tubercle bacilli may still be present; indeed, we have been able to isolate bovine bacilli from calcified abdominal glands. From such an apparently healed focus tubercle bacilli may escape and cause secondary lesions in bones, joints, urogenital system, etc., years after the primary infection in the glands has taken place.

2. Respiratory Infections

Respiratory tuberculosis of bovine origin is rare, accounting for 3.6% in our necropsy series in children (Table I), and for 5.7% of cases in Scotland and 1.9% in England, Wales, and Eire in the collected figures for all ages reported by Griffith and Munro (1944). In our series bovine bacilli were isolated from the primary lung foci or related tracheo-bronchial glands; thus there is little doubt that the infection was of respiratory origin. Infection in these cases was probably derived from open cases of pulmonary tuberculosis due to the bovine bacillus.

Conclusion

The duty of every medical man is first to prevent disease; if that is not possible, to cure; and if that is impossible, to alleviate. How is this dictum to be applied to tuberculosis? As regards prevention—human infection is the more difficult to control as there are so many known and unknown carriers of the disease in our midst. As Osler (1905) remarked: "The germ of tuberculosis is ubiquitous: few reach maturity without infection, none reach old age without a focus somewhere." It is obviously impossible to segregate all those who may spread the disease; but in factory, in workshop, in school, and in college mass radiography together with adequate clinical examination can play an important part in excluding foci of infection, especially among the young susceptible 15-to-25-years age group, in which tuberculosis is the main cause of death. But mass radiography applied indiscriminately to the population at large will achieve little if we cannot admit to hospital all those who are liable to disseminate the disease, both the young incipient and the old chronic case. Little is eventually to be gained in the control of the disease by dismissing from hospital the old chronic to provide a bed for the young case: that will only result in further spread of the disease. All this is a problem for preventive medicine. Higher standards of living, housing, nutrition, and recreation must also play their part: these are problems for social medicine. These measures may help to reduce the incidence of the disease but will not completely eradicate it.

Bovine infection is the easier to control, and in this agriculturists and veterinarians have already accomplished much. The ideal, of course, is that all milk for human consumption should come only from attested herds; but this is a long-term policy, and in the meantime some universal form of adequate heat treatment seems to be the only solution, particularly in view of the bulking of our milk supplies. This is no counsel of despair, as it must be emphasized that in addition to tuberculosis there are many other equally important milk-borne diseases which are preventable by heat-treatment, even though all milk eventually comes from attested herds.

Prophylactic vaccination with B.C.G. is still a controversial question, and over 20 years of trial has left the medical profession in a state of confusion as regards its efficacy. Many reports, chiefly from Scandinavia and more recently from America (Aronson and Palmer, 1946), and the recent Memorandum to the Minister of Health (Tytler, 1946) testify to the advisability and the adequacy of this measure. It is uncertain, however, that in a mixed population such as ours the same results would hold as elsewhere, particularly as tuberculosis is such a prevalent disease with us, and frequent infection must be the lot of us all. The discovery by Petroff *et al.* (1927–8) that B.C.G. could dissociate into avirulent R and virulent S forms raised doubts in the minds of many regarding the use of a living vaccine. No definite case of tuberculosis has, however, yet been proved as resulting from the use of properly prepared B.C.G. vaccine. Vaccines of killed bacilli have been employed with apparent success by Goodwin and Schwentker (1934), Opie *et al.* (1939), and Wells *et al.* (1944). As in all tuberculosis research, it will be long before we can assess and pass a final judgment on the efficacy of B.C.G. vaccination. This interval must be at least 15 to 25 years in order to allow us to judge its efficacy in the young adult age group, in which at present tuberculosis is such a serious problem. Meanwhile, B.C.G. may serve a useful function until chemotherapeutic or immunological research provides us with something as reliable for the cure of tuberculosis as penicillin has been for pyogenic infections. In his Memorandum Tytler (1946) has given all the essentials for a scheme of prophylactic vaccination. It is hoped that those in authority will carefully consider his suggestions, as the disaster at Lübeck is still fresh in our minds.

With regard to the cure of established tuberculous disease, nothing can be added to the valuable contribution which D'Arcy Hart (1946) has made to the chemotherapy of tuberculosis. Streptomycin is still under trial as a curative agent, and the results of these trials are awaited with interest.

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OXYGEN POISONING IN MAN

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PART II

Signs and Symptoms of Oxygen Poisoning

The available knowledge of the signs and symptoms of oxygen poisoning in man at the beginning of these experiments was extremely scanty. Only about 12 separate exposures where acute toxic symptoms had occurred had been described. It is not certain that Bornstein suffered from oxygen poisoning (see below). All these experiments were in compressed air, and with the exception of Bornstein all subjects were seated and at comparative physiological rest. The British Naval instructions at this time (1941) read as follows: "Symptoms: Tingling of the fingers and toes and twitching of the muscles, especially round the mouth (warning symptoms). Convulsions followed by unconsciousness and death if a remedy is not taken." The U.S. Naval instructions stated: "The first signs of oxygen toxicity are the flushing of the face, nausea, dizziness, and muscle-twitching. A feeling of being irritable and a sense of excitement may follow. As the pressure is increased nausea, vertigo, and, finally, unconsciousness and convulsions ensue."

It was inevitable, with the limited data available, that these instructions were brief and not altogether accurate. Tingling of the fingers and toes had not been reported in any experiment, but was inferred from its occurrence in the aura of idiopathic epilepsy. In the first large series of human experiments, described in this article, a more complete picture of the syndrome of oxygen poisoning in the human has resulted. Most of the signs and symptoms described in the pre-convulsive stage, in the auras, or in the non-convulsant equivalents of epilepsy have been encountered. As in that disease, the total of signs and symptoms is now known. Yet—again as in epilepsy—the individual pattern of signs and symptoms varies enormously within this framework. Signs and symptoms as experienced when the subjects were breathing pure oxygen in compressed air are first described, as the subjects' environment was more normal and careful direct observation was possible.

Facial pallor usually occurs a few minutes after the beginning of the exposure. It varies from person to person in degree and time of onset. The degree of facial pallor is in no way indicative of the subject's sensitivity or of an impending end-point. Fasciculation of the lips or face is often seen early in the experiment and intermittently throughout the exposure. This has been partially attributed to fatigue caused by the mouthpiece and a not unnatural nervous tension. It is a common occurrence when patients

are breathing from a spirometer for B.M.R. estimations. Fasciculation frequently appears in muscles which later show severe and sustained twitches, and it is undoubtedly increased by breathing oxygen at increased tensions. A number of subjects show facial perspiration varying in degree from fine beads to literal pouring. Generalized perspiration is infrequent, and is usually associated with the occurrence of more acute symptoms. Salivation seems to be increased (as in animals), but some is undoubtedly reflex from the irritation of the mouthpiece, and is therefore difficult to assess. Almost all the subjects appear to be under stress even though they have no specific symptoms. These are all early findings, and the subject will continue without further event for varying times according to his tolerance.

The next group of symptoms to be described may be classified as minor crises in so far as they are usually transient and the subject is able to continue breathing oxygen. The subject may complain of nausea, vertigo, malaise, apprehension, or choking sensations. Intermittent lip-twitching of a slight or moderate degree or an increase in the frequency of respiration may be noted by the observer. Palpitations, involving an awareness not only of the action of the heart but of arterial pulsation throughout the body, may cause the subject considerable discomfort. These disturbances may last for only a few seconds to a few minutes, and the subject finally resumes his former symptomless state and may continue the exposure for a considerable time before an acute end-point. The course of these minor crises is unpredictable, and the observer has to be constantly on the alert for a sudden exacerbation with danger of convulsion. Other subjects have no such transient episodes, but first experience pronounced symptoms shortly before or at the end-point.

Finally, a group of symptoms occur which, although not demanding immediate cessation of the exposure, signify that intoxication is becoming more intense and that acute symptoms will not be greatly delayed. There may be pronounced mood changes with depression or euphoria. Severe irrational apprehension, sometimes amounting to acute terror, may be experienced. Alternatively, the subject may feel "far away" or experience complete indifference to his surroundings. Others are somnolent, and in one case the subject fell into a deep sleep from which he was aroused with difficulty. At this time the attendant may notice various abnormalities of behaviour, the subject showing clumsiness with his apparatus, loss of balanced judgment, fidgeting, or the unnatural disinterest already mentioned. A sensation of depression or constriction, frequently indescribable, in the epigastrium or in the praecordium may be experienced. Visual or auditory hallucinations are late phenomena and mean that the end-point is not far off. They have only occasionally been reported in the earlier crises. Visual disturbances include flashes of light, usually in the centre of the visual fields, haloes round objects, lateral movements of images, micropsia, and apparent changes in illumination. Auditory hallucinations such as bell-ringing and knocking are far less common. Both deafness and hyperacuity are encountered. Elaborate auditory or visual hallucinations, which are classified clinically under psychical seizures, are not experienced. (Unpleasant tastes and odours have not been encountered in the "dry" but were reported by two subjects in the "wet.") Constriction of the visual fields occurs only after prolonged exposures, is gradual in onset, and can be marked, without the more acute manifestations of oxygen poisoning. In a few cases nausea and vertigo, together or separately, become so severe that the subject reverts to air-breathing before convulsive symptoms appear.

Definite twitching of the lips usually means that the end-point is near. This is the most common termination. The twitches are powerful and sustained. They are usually first seen on one side of the upper lip, but if the exposure continues they increase in power and frequency and spread to the whole mouth and face and sometimes to other parts of the body. On occasion a marked twitch is followed by a long period of quiescence before recurrence. This is exceptional, and in most cases, if oxygen-breathing continues, convulsive movements of the lips pass into generalized jactitations or convulsions. Twitching of the cheek and nose are often seen with or without lip-twitching. Occasionally there is isolated twitching of the arm, leg, spinal, or abdominal muscles.

In some cases a few seconds or minutes before the end the respirations, which are normal and serene throughout, show a number of abnormalities. The commonest occurrence is rapid panting. In other instances there is marked inspiratory predominance, reminiscent of asthma, but without wheezing. Respirations sometimes become grunting in character, and in severe cases this may develop into an acute state of apnoea in the inspiratory position. Subjects with severe respiratory symptoms usually convulse, although a few escape on being turned on to air.

It will be seen that an accurate description of such a varying picture is not easy. The clinical impression gained was of two distinct processes occurring in many different patterns. One is an insidious intoxication which may affect the function of practically any part of the central nervous system, and added to this is an increasing convulsant tendency that is usually, but not always, first manifested in the facial muscles and finally becomes generalized. There are great variations in the resistance to the general background of intoxication and in the resistance to the convulsant factor. Certain individuals may show powerful twitching movements, either localized or generalized, but retain consciousness, while others pass into what is indistinguishable from an epileptic fit immediately after such convulsive movements and sometimes in their complete absence.

The syncopal type of attack was seen on only a few occasions. There were usually associated muscular twitchings. One of these subjects appeared like a case of so-called "shock," being pale, flaccid, and in a cold sweat, with a poor pulse. He did not convulse. The blood pressure was not ascertained. Another subject collapsed but did not appear to be "shocked." He was unable to move or speak, although he appreciated his surroundings. Such states are described in epilepsy under the name of cataplexy. Space does not allow the description of individual exposures.

Convulsive Attacks

The convulsive attacks of oxygen poisoning were on the average of two minutes' duration, the subject being unconscious. If the subject was turned on to air immediately the convulsion started only one attack resulted. In one case where oxygen breathing was inadvertently continued a second convulsion began after a pause of about thirty seconds. Incontinence occurred in a number of instances. Detailed description of these attacks is unnecessary as they in no way differed from a major convulsive attack of idiopathic epilepsy.

Confusion, dissociation, headache, nausea, and vomiting as experienced after an epileptic fit occurred in many cases. Some individuals showed marked emotional instability, which is not a feature of leptazol or electrically induced post-convulsive states. The majority, however,

were subdued and ataxic for about 15 minutes after, and if left alone fell asleep. Occasionally subjects complained of pronounced photophobia. In a number of cases there was post-convulsive automatism, the subject suffering from complete amnesia for a period from one-half to seven hours. There were some stiff backs and subcutaneous extravasation due to muscular violence.

Off-effect

A number of subjects suffered marked exacerbation of symptoms after returning to air-breathing. Severe nausea, increasing pallor, sweating, and vertigo have all occurred in subjects who were previously symptomless. Other subjects showed a sudden dissociation and panting. In a few cases it appeared that convulsions were precipitated by reverting to air-breathing. A possible explanation of this off-effect may be the sudden fall in oxygen tension, causing temporary cessation of respiration in already damaged nerve cells. In some cases, no doubt, the toxaemia was already of such a degree that convulsions were inevitable. Decompression appears to precipitate convulsions in such subjects and also in animals. The "startle" phenomenon, where sudden and unusual sensory stimuli precipitate convulsions—that is, decompression—may account for some of these cases.* It has therefore become a rule in this work that if a subject has severe symptoms and reverts to air-breathing he is not decompressed until his symptoms have gone and relative normality has been attained.

The recovery from a non-convulsant end-point is remarkably rapid and the subject appears normal in five minutes or less. All twitching usually disappears in about a minute. The subject may appear dazed for a few minutes longer and his respirations are inclined to be irregular, with intermittent deep excursions. Euphoria is frequent, but this may well be due to relief at having survived a toxic exposure without convulsing. In some cases pallor persists for as long as an hour, and sometimes the subject behaves as if he were slightly drunk for the same period. This latter syndrome is known in experimental diving circles as "oxygen jag."

Oxygen Poisoning under Water

So far only signs and symptoms as seen in the "dry" have been described. In a series of 388 dives to end-point, under water, the following symptoms were recorded: convulsions in 46 (9.2%) cases; twitching of lips, 303 (60.6%); vertigo, 44 (8.8%); nausea, 43 (8.3%); respiratory disturbances, 19 (3.8%); twitching of parts other than lips, 16 (3.2%); sensations of abnormality (drowsiness, numbness, confusion, etc.), 16 (3.2%); visual disturbances, 5 (1%); acoustic hallucinations, 3 (0.6%); paraesthesiae, 2 (0.4%). The most striking observation is the remarkable predominance of lip-twitching. It is probable that many of the more subtle symptoms occurred but that they were difficult to appreciate under water. A number of divers who reported severe lip-twitching, and were hauled up jactitating and confused but did not convulse, remembered only severe lip-twitching as their end-point. Further observations by the attendant at such a critical time were difficult, particularly with the subject in a diving-suit.

Since Bornstein's single experiment in the "dry" (1912) it has often been stated that exercise at toxic tensions caused twitching of the muscles employed. In a series of "wet" dives to toxic depths with hard work symptoms were analysed in 120 end-points. The findings were as follows: Convulsed, 6.8%; lip-twitching, 50%; vertigo, 20.8%; nausea (vomiting two cases), 17.5%; choking sensations, 2.5%; dyspnoea, 2.5%; body tremors, 1.7%.

It appears that nausea and vertigo increase in frequency if the subject is exercising. Twitching of the muscles being exercised was not encountered in the whole series. Carbon dioxide absorption has to be extremely efficient with hard work, especially in air, where the canister becomes very hot, and a large series of such experiments in the "dry" were marred by inadequate carbon dioxide absorption and are not reported here. In these "spoiled" experiments the subjects experienced twitching of muscles and severe tremors, and this was shown to be due to high tensions of carbon dioxide in the circuit.

Subjects breathing oxygen at increased tensions before toxic signs or symptoms occur are remarkably normal. The mental torpidity described by some observers has not been noted, even at considerable depths, except after long exposures in the "dry." Judgment and the capacity for hard physical work appear to be in no way impaired. Under-water divers are more free of symptoms than those in the "dry" right up to the moment of lip-twitching or convulsing. No doubt the abnormal environment and accoutrement obscure the minor premonitory symptoms. This apparent normality and the frequent suddenness of convulsive symptoms make oxygen-breathing under water at toxic depths highly dangerous, particularly as the subject often gains a very false sense of security.

Special Investigations

These experiments were carried out under war conditions, and owing to the urgency of the work and the many other immediate operational problems being investigated it was unfortunately not possible to extract the maximum data from this unique series by elaborate special investigations. However, a number of important observations were made, and these will now be considered under appropriate headings.

"Lorrain Smith Effect" (Pulmonary Damage) in the Human

Lorrain Smith (1899) reported fatal pneumonia in a rat after four days' exposure to 73% oxygen. Many animal experiments have been carried out since, and the general conclusion has been that 60% oxygen causes no pulmonary damage in animals or man (Barach, 1926) even after indefinitely prolonged exposures. Becker-Freyseng and Clamann (1939) produced bronchopneumonia in a healthy man by breathing 90% oxygen for 60 hours.

In over 1,000 experiments where subjects were breathing oxygen at toxic pressure (4.68–1.9 ats. abs.) the exposure was always terminated owing to signs or symptoms involving the central nervous system. Frequent chest examinations were completely negative. At more shallow depths, however, nervous symptoms are encountered only after very long exposures or not at all. It was thought possible that there might be a greater risk of lung damage at such depths. Dives up to three hours at 2.1 ats. abs. in the "wet" caused no pulmonary irritation. A series of prolonged dives to 12 ft. (3.7 m.; 1.36 ats. abs.) with periods at 50 ft. (15.2 m.; 2.5 ats. abs.) gave equally negative results. An example was a dive for 6 hours 9 minutes, continuously in oxygen at 12 ft. (5 hours 39 minutes) and at 50 ft. (30 minutes), where no pulmonary irritation was encountered.

It can be stated with reasonable certainty that no real under-water dive will be made where lung damage will result from high tensions of oxygen, and that at depths greater than 30 ft. (9.2 m.) nervous symptoms will terminate the dive long before any pulmonary irritation occurs. Lorrain Smith (1899) reported that a rat died of pulmonary damage after 20 minutes at 4.5 ats. abs. of oxygen, yet a subject completed 61 minutes at 4.6 ats. abs., breathing oxygen, with no demonstrable pulmonary damage. Total evidence suggests that man has more resistance to lung damage than small experimental animals.

* Since writing this article it has been noted that a similar suggestion was made by J. W. Bean (1945).

A number of these subjects breathed oxygen at increased tensions several times a week for two years. It was considered possible that although the pulmonary damage suffered in a single exposure was inappreciable there might be a cumulative effect. Frequent routine examinations of the subjects' chests were therefore carried out. Radiographs were taken regularly and the vital capacities noted. In not a single case has there been any positive finding suggestive of lung damage. The subject who dived to 70 ft. (21.3 m.) to end-point two or three times a week for three months won the Portsmouth middle-weight boxing championship during this period. It would appear that there is no cumulative effect on the lungs in oxygen-diving.

Cardiovascular Findings

Benedict and Higgins (1911) reported bradycardia in man breathing increased percentages of oxygen at atmospheric pressure. This finding has often been confirmed, both in man and in animals. Bean and Rottschafer (1938) showed with animals that, although the bradycardia was mediated by the vagus, blocking of this nerve had no effect on oxygen poisoning. In the experiments described here it was found that, although the pulse changes were little more than could be accounted for by prolonged basal conditions, there was in some cases a marked slowing of the pulse (35–50), particularly after long exposures at 60 ft. (18.3 m.). The pulse was regular and there was no suggestion of dropped beat or any type of heart-block. Some of these subjects who did not convulse did not recover their normal rate till several hours after the exposure. The degree and rate of onset of the bradycardia had no fixed relation to tolerance or other symptoms, nor did the pulse changes give any warning of acute symptoms or convulsions.

Only a limited number of blood-pressure recordings were made at 90 ft. (27.4 m.). There was a gradual rise of both systolic and diastolic pressures, which stabilized after some 20 minutes at about 15 mm. above the normal levels. Just before the onset of acute symptoms a further brisk rise of about 15–20 mm. occurred. These findings are similar to those of Behnke *et al.* (1935–6). Microscopical study of the subjects' nail-bed capillaries while under toxic tensions and while suffering acute symptoms revealed no significant changes. *X*-ray and clinical examinations have shown no enlargement of the heart in subjects who were often exposed to toxic tensions over a long period. It is difficult to see why this should occur unless there is severe pulmonary damage, but it is a common belief among medical officers and divers, particularly in the Italian Navy, that oxygen-breathing increases the size of the heart. This was not confirmed.

Neurological Findings

In experiments continued over a period of three years no adverse after-effect has been noted in any subject's neurological integrity, intellectual ability, or personality. Neurological examination of subjects while breathing oxygen at 60 ft. (18.2 m.) and 90 ft. (27.4 m.) in the "dry" showed no significant change in reflex activity. Constriction of the visual field has already been mentioned. Some subjects showed marked dilatation of the pupils as they approached the end of the exposure. The only other important finding was the development of a positive Chvostek sign in a number of subjects during exposures. Although this usually developed in the latter half of the exposure, it was not a reliable sign of the approach of acute symptoms, although if present it became more marked as the exposure continued. Some subjects had an acute end-point without the occurrence of a positive Chvostek sign at any time. Controls in air at atmospheric pressure revealed that a few otherwise normal subjects had a positive Chvostek sign, which in some cases was present one day and absent on another. Such a finding in air, or even developing during the exposure, did not necessarily signify poor oxygen tolerance. In one quite unique subject acute symptoms always started with twitching of the muscles of the left hand (the only case of twitching of the hand recorded in the whole series), which then spread up the arm to the shoulder, and on two occasions this was followed by convulsions. This series of events was similar to a Jacksonian attack and quite unlike the usual muscular twitching.

Electro-encephalographical Findings*

Briefly, exposure to oxygen at 120 ft. (36.6 m.) had no immediate effect on the E.E.G. recordings. In general there was a slight increase of fast activity (25–32 p/s) and also increase in voltage of the 3–5 p/s waves. Coupled with this was a progressive decrease of the amount and voltage of the dominant frequencies (6–12 p/s). The tracings tended towards a sequence of 3–5 p/s waves with a superimposed ripple of fast activity. These abnormalities were episodic. Infrequently, spikes—that is, single high-voltage fast sine waves—appeared and increased in number. They were bilateral and symmetrical. Subjects who had non-convulsant end-points showed no other changes. Those who convulsed gave a picture of electrical activity during and after the fit which was indistinguishable from that seen in grand-mal epilepsy. It was apparent that there was nothing specific in the convulsions of oxygen-poisoning, as regards electrical activity, once they had started. In some cases there were signs of disturbance—that is, short bursts of 5 p/s activity with increasing voltage just before the attack. Others showed no change of cortical electrical activity before the major convulsive attack. In view of the similarity of the convulsions, both clinically and electrically, to those of epilepsy it was thought that a study of the E.E.G. of subjects in air, and with hyperventilation, might show inborn instabilities that could be correlated with oxygen tolerance. Fifteen subjects from the Admiralty Experimental Diving Unit were graded in order of average oxygen tolerance. This was based on many dives at various depths in the "wet" and in the "dry" over a long period. There was no statistically significant correlation, although the three most resistant subjects had normal E.E.G.s. However, the other two "normals" occurred in the last five in the endurance rating. No "normals" had convulsed at this time, but two did so in the later experiments.

Electromyographs of the lower facial muscles showed bursts of potential with lip-twitching without any associated abnormality of cortical electrical activity. Conversely, bursts of fast cortical activity occurred without increase in muscle action potential. Observations showed that clonic movements or twitching of peripheral muscles was not necessarily associated with changes in the E.E.G.

Toxic Effects of Oxygen on Brain Metabolism

Prof. F. Dickens (1946), in associated M.R.C. (R.N.P.R.C.) research, investigated the action of high-pressure oxygen on rat-brain slices. This work is briefly referred to here for the sake of completeness. He showed that the respiration of isolated cerebral cortical tissue is progressively and irreversibly poisoned. Curves plotting the percentage fall of initial respiratory rate against time were remarkably similar in type to those showing the elimination of a group of individuals by toxic symptoms at a fixed depth (see Fig. 4 "dry"). The time/pressure relationship for a fixed degree of respiratory poisoning was also of a similar type to that obtained for the means of times causing acute symptoms in a group of men at various depths. The order of sensitivity to high pressures of oxygen of the various rat tissues was as follows: Brain cortex > spinal cord > liver > testes > kidney > lung > muscles. The actual tension of oxygen in the brain tissue *in vivo* and *in vitro* under these conditions is not yet accurately known, but from Dickens's experiments it is certain that convulsions occur in man and animals when the brain tissue respiration is but minutely impaired. A similar problem is presented by the effect of narcotics on brain slices and *in vivo* (Quastel, 1939). Dickens presents strong evidence that the primary effect may be in the inhibition of pyruvic oxidase, and that the secondary effects would be general poisoning of carbohydrate oxidation, since all known paths of carbohydrate oxidation converge at the stage of pyruvate. Magnesium, manganese, and cobalt ions strongly protect pyruvic oxidase from oxygen poisoning in tissue slices. Protection by metallic ions is not entirely similar *in vivo* in animal experiments (Marks, 1944). In view of the known –SH character of this enzyme and the known ability of these metals to protect this group, it is likely that

* These unpublished E.E.G. investigations were carried out in the later collateral M.R.C. (R.N.P.R.C.) research by Brown, Downman, MacIntosh, and Williams. The unit subjects were employed in a number of the experiments.

the –SH group of pyruvic oxidase is the seat of oxygen poisoning. The irreversibility of the poisoning in these experiments may be explained by the known difficulty of reconstituting the –SH group *in vitro*. If, as it appears, convulsions or acute symptoms occur in a very early stage of this process, then reactivation in the more physiological conditions of the intact organism is extremely feasible. This would account for the reversibility of acute oxygen poisoning in man and animals if the exposure is immediately discontinued.

Discussion

The most important aspect of oxygen poisoning is the intoxication of the central nervous system. It seems that the whole cerebrospinal axis is involved. The twitching of the muscles is definitely subcortical in origin, and the sensitivity of the facial nerve to tapping would indicate that even the most peripheral components are affected. Meanwhile the cortex is also being poisoned, and in a number of cases phenomena exactly similar to epileptic auras occur which are presumably due to cortical dysfunction. In some cases severe muscle-twitching, and even convulsions, may be precipitated without any such aura being reported. The more peripheral motor discharges may predominate throughout and even cause generalized jactitations without electrical or clinical evidence of cortical disturbance. In other cases non-convulsant cortical disturbances may cause symptoms of such severity that the exposure is discontinued. The remarkable individual variation in reaction to unphysiological tensions of oxygen is again emphasized.

It is not known why the lips should be so specifically affected. The possibility of the added irritation and fatigue caused by the mouthpiece was considered, but was excluded by the demonstration of lip-twitching in man in helmets without mouthpieces (Donald, 1942), and also in rabbits and other animals (Marks, 1944). These peripheral twitching movements are almost certainly related to the myoclonic seizures of epilepsy, in contrast to the Jacksonian type of attack. These myoclonic seizures commonly affect the face, but can occur elsewhere. Penfield and Erickson (1941) concluded from electro-encephalographic studies that these attacks originate from the grey matter in the brain stem and spinal cord. It is significant that a similar conclusion has been reached with regard to the origin of the muscular twitching in this work. Of equal interest is the comparative rarity of myoclonic seizures and frequency of Jacksonian seizures in epilepsy, and the reverse in oxygen poisoning. The rarity of somato-sensory disturbances (paraesthesiae) and elaborate hallucinations (perhaps associated with absence of petit mal) is worthy of note. At no time was any attack akin to petit mal observed either clinically or electrically. Thus even in oxygen poisoning, in which epileptic auras are closely imitated, petit mal is unknown. This emphasizes the uniqueness and importance of that phenomenon in idiopathic epilepsy.

A small group of naval epileptics (five) tested by the M.R.C. workers did not show any apparent increase of sensitivity to oxygen poisoning, but the experiments were too few for definite conclusions to be drawn. Penfield emphasizes the great variability in the physiological state of the epileptic cortex. "It may be quite normal in reaction, or it may be abnormally stimulable, completely refractory, or at other times unequally hyperactive." Such variability of behaviour combined with the enormous variability of human susceptibility to high pressures of oxygen makes a far larger series of experiments desirable. However, the pattern of toxic symptoms appeared similar to those in normals, and the general impression gained was that there was no essential difference of reaction, or any increased accessibility to the convulsant mechanism, by the channels or processes involved in oxygen poisoning. It is possible, and indeed highly probable, that there are distinct chemical or cellular systems the adequate and separate disturbance of which will allow or cause convulsions. On first principles it would appear likely that the depression of essential carbohydrate oxidation in nerve cells would cause depression in function and not increased activity. If this is the case, then the "auras," motor twitches, and convulsions are more likely to be release phenomena and not due to primary excitability of the parts of the central nervous system concerned. The sudden violent discharge to utter exhaustion (as shown in convulsions by the E.E.G.) is strange behaviour in cells in which the oxidative processes are damaged.

The relatively slow and deliberate evolution of auras akin to those experienced in epilepsy is, so far as I know, unique to oxygen poisoning and should be further exploited by experimental workers. Although the condition is artificially produced, it approximates far more closely to the natural epileptic phenomenon than other induced convulsant states. The electrical localization of epileptic discharges in idiopathic non-convulsant equivalents has already been carried out in a number of cases. It would be possible to select resistant subjects who experienced definite auras without marked "peripheral" motor discharges. The electrical study of these auras in such subjects would be a new approach to the problems of cortical localization and function. Further study of the various patterns of cortical dysrhythmias before convulsions may contribute to the knowledge of the mechanisms of epilepsy.

The therapeutic use of oxygen as a convulsant in the various psychoses has been suggested in the past, but the lack of knowledge of the syndrome, combined with the greater ease and safety of other methods, has so far prevented its use for this purpose. The complicated and rather frightening ritual (to strangers) of pressure work, and breathing from a closed circuit, render the value of this method very questionable. Changes in the central nervous system could be induced up to the point of convulsions. With experienced attendants these could be avoided in most cases if desired. Evidence may be obtained as to whether the improvement, if any, was caused by such changes alone or by the convulsions they can precipitate.

Conclusions

In the first large series of experiments on human beings, knowledge of the dangers and symptoms of oxygen poisoning has been expanded. It has been demonstrated that these dangers are far greater than was previously realized. The variation of tolerance between individuals, the variation of tolerance of each individual, the impairment of tolerance with work and under water, all make diving on pure oxygen below 25 ft. (7.6 m.) of sea-water a hazardous gamble. The impairment of tolerance under water is as mysterious as it is unfortunate. Despite the fact that a comprehensive picture of human symptoms of oxygen poisoning is now available, it is emphasized that no signs or symptoms can be given that would ensure a timely cessation of oxygen-breathing in all cases. The variation of symptoms even in the same individual, and at times their complete absence before convulsions, constitute a grave menace to the independent oxygen-diver. The only possible conclusion is that such tensions of oxygen should be scrupulously avoided.

Summary

Previous research into the effect of increased tensions of oxygen on man up to the commencement of this work is briefly described.

An account is given of experiments to determine the tolerance of groups of men to such tensions of oxygen under varying conditions.

The signs and symptoms of oxygen poisoning in man are described.

The possibility of pulmonary damage by increased tensions of oxygen is discussed.

Electrical and chemical changes in the central nervous system are briefly described.

The relation of oxygen poisoning to epilepsy and the possibilities of further useful investigations are discussed.

The danger of breathing oxygen at increased tensions is emphasized.

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The British Legion Unit of Rheumatology, set up experimentally by the British Legion a year ago, to specialize in the treatment of ex-Servicemen and women suffering from rheumatic diseases, has now been transferred, complete with staff, from the Three Counties Hospital, Arlesey, Beds., to the North-West Hospital, Haverstock Hill, London, N.W.1. The Minister of Health has agreed to take over the unit on May 31, and to encourage the provision of further units throughout the country.

ACUTE NON-SPECIFIC DIARRHOEA AND DYSENTERY

LOCAL CHILLING OF THE ABDOMEN AS A CAUSATIVE FACTOR

BY

G. R. KERSHAW, M.A., M.R.C.S., L.R.C.P.

Acute enteritis of unknown origin is common in Europeans visiting and living in hot climates. It is so common and so widespread that the lay public in every country use a colloquialism peculiar to their district to describe the local manifestation of a complaint which, though second only to sea-sickness in its power of temporary prostration, seldom lasts more than a few days, so that it is soon forgotten or is accepted as a perennial part of the white man's burden. Its social and economic consequences, though brief, are severe to the individual, but its military consequences can be disastrous to a community of fighting-men: apart from jeopardizing a single operation there is nothing so calculated to lower morale as recurrent attacks of diarrhoea.

In the intervals it is made light of by the public and is rarely considered seriously by the profession. Not all standard textbooks or monographs even refer to it, and in those that do so it is seldom discussed at a length which suggests that it is probably the illness encountered most commonly among the white population in hot climates. Even the most reputable authors, moreover, show little confidence, agreement, or justification in describing its cause, and still less in recommending prophylactic measures. It is ascribed variously to "exposure to chill, and irritation of the bowel by coarse and unsuitable food" (MacArthur, 1942), to potentially pathogenic bacteria (McDonagh, 1942), to "the recognized dysentery organisms, precipitated by sudden chilling" (Napier, 1946), and as "probably bacterial in origin" (Manson-Bahr, 1945). Macgregor (1946) gives good reasons for this dissatisfaction with the traditional causes and, after showing a close association in time with acute upper respiratory disease, favours a virus infection, on the principles believed by Burns and Gunn (1944) to cause diarrhoea in infants, as described in a *B.M.J.* editorial (1942).

Opinion is, therefore, overwhelmingly in favour of infection, and this belief is based on three main points: (1) Its symptomatology is similar to that due to known pathogens. (2) It occurs in outbreaks as well as sporadically. (3) In the many outbreaks of enteritis of unknown cause during the war it has been shown that the more thorough the investigation the more often is a known pathogen recovered (Hardy and Watt, 1945). Similar symptomatology, however, is known to occur with any form of irritation within the lumen of the gut, and its simultaneous appearance in different people is by no means necessarily indicative of infection; while to attribute the disease to an unknown organism which has never been demonstrated is to admit to a degree of professional complacency which is as astonishing as it is unscientific.

Chilling of the Abdomen

Perhaps equally unscientific, but of longer duration, is its traditional association with chill. In some (MacArthur, 1942; Napier, 1946) references to acute enteritis exposure to chill, in quite general terms, is mentioned as a probable factor in its cause, either predisposing or actual; this appears to have passed from one book to another without much consideration or justification. Now it is in fact a matter of common knowledge that *chilling of the abdomen* by the rapid ingestion of cold fluid in large quantities when the body is hot does often induce diarrhoea, and it is fairl

well recognized that *chilling of the anterior abdominal wall* frequently does likewise. Too much ice-cream or too long an iced drink, or moderate amounts of either taken quickly instead of by sips, are methods of provoking diarrhoea as proverbial as that of allowing a wet bathing costume to "dry on" while sun-bathing. Bampfield (1819) wrote as follows:

"The copious perspiration of the newly arrived European becomes accumulated, when he is sitting or walking, on the lower part of the shirt, more especially about that part of the abdomen where the waistband of the small clothes or pantaloons presses against it, the tight or close application of which occasions an increase of heat and of perspiration at this particular part, during the day, and intercepts the exhalation as it flows down the body; hence, if he should lie down in this state, cold will be induced on a particular part of the abdomen, by the evaporation of the exhaled fluid from the wet linen in contact with it; perspiration, before profuse, will be now effectually suppressed, and its injurious consequences felt by the chylopoietic viscera."

Johnson and Martin (1841) introduce this quotation to their readers by saying: "We do not recollect that the following circumstance has ever been noticed heretofore as a predisposing cause of dysentery." McDowall (1927) writes:

"The wearing of so-called cholera belts signifies the importance of keeping this particular region of the body (the abdomen) warm, for the alimentary canal is a region especially liable to be infected as a result of cold. The production of diarrhoea or the return of symptoms after an attack of dysentery, which may follow a cold bath or sea-bathing, has long been recognized."

Hints to Travellers (1938) states that "A drop in the night temperature in the Tropics constitutes another danger, so protect the abdomen with warm clothing at night time," and it advises the traveller to "consider . . . also the liability to chill, and whether the often derided cholera belt is essential." Napier (1946) writes:

"The flannel cholera belt, whose powers of cholera prevention were of course mythical but which could be guaranteed to produce a nice band of prickly heat in most climates, has fortunately gone out of fashion. Quiescent abdominal infections are sometimes stimulated into activity by local chilling which the cholera belt was designed to obviate; it is therefore advisable for those subject to attacks of diarrhoea to put wraps round their abdomens, rather than over their shoulders, when cooling off after exercise."

Physiological Deductions

Better understanding of physics and physiology enables the present-day physician to appreciate that, owing to the high latent heat of steam, the anterior abdominal wall is seldom more chilled than by the evaporation of sweat, and also that as the temperature of the air rises so does the proportion of body heat lost by evaporation, to the eventual exclusion of other methods. He can furthermore predict other factors which will influence this process—namely, the humidity of the air and the velocity of air movement.

Diarrhoea is therefore to be expected in those entering a hot climate from a cold one, whose thinner clothes afford less protection from the cool evening breeze to an abdomen accustomed to thicker and warmer clothes; whose garments in the heat of the day cling to the abdominal wall, where they lie closest to the body, and provide a system whereby the greater the temperature the more body heat shall be lost through this vulnerable surface. It is to be expected that residents in hot climates should suffer frequently from diarrhoea while they are continually exposed to the same conditions, that the frequency of attacks should be highest in the early months of summer (Northern Hemisphere), when the diurnal variation in temperature is greatest, and in the autumn or rainy season, when a higher humidity causes the body surface to be covered with a film of perspiration at moderate or similarly varying temperatures.

Clinical Observations

Too many have ample (and painful) experience that these expectations are often fulfilled; some clinical observations made in H.M. ships during the war may, however, provide more acceptable evidence than personal reminiscence. Typically the patient was awakened shortly after midnight with generalized abdominal colic and an urgent call to defaecate; vomiting was rare and tenesmus absent. In mild cases a few loose stools and waning bouts of colic saw the end of the attack by the following midday, but in severe cases the colic persisted and the stools became watery, progressing even to mucous and blood-stained, and the course lasted several days with marked prostration and anorexia and a slightly raised temperature. Spontaneous recovery was rapid and complete.

Sporadic cases were frequently observed to occur, more often in warm climates than in cold, among those working in parts of the ship where the temperature, air velocity, and humidity were highest, and in those wearing unsuitable clothing—for example, overalls without undergarments, shrunken sheepskin waistcoats; and, until recognized, a central source of cold drinking-water proved to be the cause of this complaint also in hot weather. The frequency of small and large outbreaks was remarkable and in contrast to the exceptional rarity with which known pathogens were detected upon appropriate bacteriological investigation when this could be undertaken; moreover, not one corresponded epidemiologically in any way to the expected features of disease borne by water, food, insects, or droplet infection. It will be appreciated that distilled water was used nearly always, and that analysis of water from the storage tanks was rarely performed but never suggestive. Outbreaks usually started during the night, mostly throughout the hotter months of the year, with a first peak in early summer and a second, and larger, peak in the "sticky" period of early autumn. Three major outbreaks were observed: before landfall at the end of quick passages from England to the Eastern Mediterranean; during unaccustomed and exceptionally cold weather in Arctic waters; and on passage through the Suez Canal from South to North.

Investigations

The routine and repeated examination of patients' stools was carried out whenever facilities were available. In the course of three and a half years I recollect only one case being diagnosed by laboratory methods as a specific infection. No other significant findings were reported.

Water.—It will be appreciated that the water consumed on board was nearly always distilled in the ships, but sometimes obtained from a certified source ashore. The fresh-water storage tanks were cleaned and relined without any alteration in the incidence of the attacks, and two analyses of the water showed nothing suspicious in content or in comparison.

Food.—Most food was stored up to three months, but meat consumed after three years in the cold-store did not alter the incidence, nor did the lack of fresh fruit and vegetables during a period of some months. Tinned food was mostly uncrated and some tins were badly dented, but blown or doubtful ones were discarded. Attacks of enteritis were not associated with any particular foodstuffs, and those who had had their evening meal ashore were equally affected.

Food preparation and handling.—No history of specific intestinal infection was obtained from the cooks, and they were from time to time victims of the outbreaks themselves. Food was prepared centrally, in one large galley, and in three small ones contained in a separate compartment; it was

prepared for immediate use only. The temperature of the water used for the washing of cooking and eating utensils was always over 130° F. (55° C.) and usually very much hotter.

Droplet infection and insect vectors.—The incidence of attacks was not associated in time with that of either acute upper respiratory disease or sandfly fever. Close contact between cases was not a feature of the disease, and the incidence was not higher among the sick-berth staff who slept in the sick-bay than in others. The peaks of the attacks corresponded with the maximum prevalence of flies, but attacks occurred when flies were altogether absent; cockroaches abounded at all times in the galleys and pantries.

While the practice of hygiene and the limitations of investigation by operational conditions were open to criticism, conditions were sufficiently sterile, metaphorically if not bacteriologically, to warrant attention being turned to chilling of the abdomen as a possible factor in causation. In fact the association was noticed early and the more often it was sought the more frequently it was found, until in the explosive outbreaks it was observed so constantly that it was established beyond doubt. It has been said that attacks began typically soon after midnight and affected those who ate their evening meal ashore or those joining ship in the afternoon as frequently as those whose shore-leave had been stopped for many days. The only common factors remaining were the cool of the evening and the first few hours of sleep; the majority of ratings slept in hammocks, and hammocks were slung from the deckhead—the very place where the cool night air was introduced into all living spaces below deck by an extensive plenum system of ventilation.

Plenum Ventilation in Ships

This extreme frequency in ships was generally attributed to the plenum system of ventilation. The overcrowding of troopships was a notorious necessity, and in one warship in which many of these observations were made Sir Sheldon Dudley's (1946) appreciation of the spatial restrictions was by no means an overestimate, for in many compartments both the space per man and the number of air changes were half those intended at the very times they should have been liberal. The dry-bulb temperature of a forward mess deck when unoccupied, in one ship, was observed to be 90° F. (33° C.) in November evenings in the Western Mediterranean and in another ship to be constantly between 90° and 110° F. (43° C.) in a cabin amidships during four summer months in two consecutive years. In consequence working or resting in comfort was possible in some instances only so long as the louvre was pointing towards the body, the anterior surface giving the greatest relief; while at night, with blackout restrictions added, a few hours' rest was achieved only by lying (often with overalls rolled down to the waist) within a few feet of the louvre—a unique arrangement, since hammocks must be slung from the deckhead of living-spaces, where the plenum apparatus is properly spaced to avoid this very same effect by day. Ratings continued, even after being advised against it, to sleep wearing overalls rolled down to the waist with no other covering, and in cabins it was a common practice to direct the flow of air to the bunk by tying pyjama trousers to the louvre. In the explosive outbreaks the ratings who slept in hammocks suffered much more frequently, more severely, and earlier than those who slept on camp-beds. It is pertinent to add here that in the previously mentioned outbreak in Arctic waters one victim was an officer, keeping a night watch in an exposed position, who was wearing a very shrunken sheepskin waistcoat.

The presentation of these few clinical observations in logical sequence may carry conviction that chilling of the abdomen or anterior abdominal wall is a common cause of acute non-specific enteritis ashore and afloat in all climates, but especially hot ones.

Prophylactic Measures

Whether it is the predisposing or actual cause is for practical purposes unimportant in the present state of medical knowledge, for prophylactic measures against this disease are not only common-sense but calculable. On entering a hot climate suddenly, which air travel will render more frequent in future, the change from thick to thin clothes should be made gradually, if possible, and an undervest worn and exercise avoided until acclimatization is achieved. During residence a bush-shirt, or a loose-fitting shirt with cellular undervest, should be worn, and a change to thicker clothes, if at all possible, made before sundown. An undervest should be worn, especially in spring and autumn and in windy or humid weather. Cool drinks should be sipped slowly by day, and sitting in the direct draught of forced ventilation for long periods should be avoided.

The plenum system as arranged in living-spaces for daytime usage is unsuitable for the ventilation of sleeping accommodation where hammocks or tier bunks are employed. By night a cholera belt or a blanket folded across the abdomen should be worn with or without other bedclothes.

Whatever the mechanism of the predisposing cause, opinion is still overwhelmingly in favour of infection being the actual cause. The obstinacy with which this belief is held without any basis in fact amounts to bigotry; until such an organism is demonstrated it would be at least reasonable to attribute the enteritis to a change in the oecology of the intestinal tract, which might fairly be presumed to be a sequel to vascular reflexes stimulated by chilling, but there is as yet, I believe, no evidence to show that it is not attributable to either neuromuscular reflexes or even purely physical causes such as chilling or salt deficiency (Stenning, 1945). Since it is evident that no further progress is likely from clinical observations there is here a strong case for experimental research.

Summary

Acute non-specific enteritis is common in hot climates. Its social and military consequences are important.

Its cause is subject to dispute, and prophylaxis is uncertain.

Local chilling of the abdomen is a known cause of diarrhoea. Circumstances causing local chilling are common, still more common in hot climates, and extreme in overcrowded ships. Examples attributed to this cause are given.

Prophylactic measures are deduced.

A plea is made for experimental research.

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EPIDEMIC DIARRHOEA AND VOMITING

BY

E. R. HARGREAVES, M.B., B.Ch., D.P.H.

Two small outbreaks of epidemic diarrhoea and vomiting which occurred in Cornwall during 1946 are described below; they supply presumptive evidence of the incubation period and mode of spread of the disease, and, further, that given favourable soil the condition can prove fatal. A review of the literature is included in an attempt to analyse the similarities and differences between "epidemic nausea and vomiting," "epidemic diarrhoea and vomiting," and "endemic diarrhoea and vomiting of newborn babies."

Observations

A mild form of diarrhoea and vomiting had been endemic in Cornwall throughout 1946; the first cases were noted in March, the disease reaching a peak in May and again in October. The first of these two epidemics broke out at the Redruth Public Assistance Institution in early June. The hospital block in which most of the cases occurred is a two-storied building standing alone. The top floor contains a ward for female bed-patients (A), a small ward for sick children (B), one for male bed-patients (C), and the nurses' kitchen and dining-rooms; the ground floor has wards for male (E) and female (D) up-patients. The children's nursery (F) and a ward for low-grade mental defectives (G) are in separate blocks, both a considerable distance from the hospital.

All the food in the institution, except that for the nurses, is prepared in a central cookhouse, which has been modernized and is in every way satisfactory; none of the six girls employed in the preparation of the food at any time suffered from diarrhoea or vomiting. The cookhouse for the nursing staff is on the top floor of the hospital block. A cook and a maid are employed, the maid being off duty with diarrhoea and vomiting from June 10 to 13. The water supply (mains) and the milk supply (accredited) were both investigated, with negative results.

The first case occurred on May 31 in Ward A; the subsequent 32 cases and the dates of their appearance are shown in Table I.

TABLE I.—*Cases at Redruth*

Ward	No. of Cases	Population at Risk	Attack Rate	Date of Occurrence
A: Women bed-patients	7	14	50%	May 31, June 3, 6, 6, 8, 11, 13
B: Sick children ..	—	6	—	
C: Men bed-patients ..	5	14	35%	June 1, 1, 1, 3, 6
D: Women up-patients	—	30	—	
E: Men up-patients ..	1	30	3%	June 13
F: Children's nursery	—	12	—	
G: Mental patients ..	8	24	33%	June 10, 10, 11, 11, 14, 14, 15, 15
H: Nursing staff ..	9	12	75%	June 7, 7, 10, 12, 12, 15, 15, 15, 17
I: Domestic workers ..	3			June 7, 10, 14

It will be noted that the sick children's ward escaped infection in spite of its position between the two wards most seriously involved, that in each ward the interval between cases was approximately 72 hours, and that the mental ward was the only part of the institution other than the hospital block to be affected. A domestic worker who was employed in Ward A but slept in a side ward on the mental block developed the disease on June 7; the first case occurred among the mental patients on June 10.

Details of the clinical history of the epidemic are included in Table III. Briefly, the symptoms were mild, though diarrhoea in a few cases was prolonged and severe; definite prodromal symptoms were absent, the attack beginning with lower abdominal colic, followed within half an hour by forceful repeated vomiting. Alternatively the abdominal pain was absent, vomiting being the primary symptom and so sudden in its onset that the patient vomited over the table or bedclothes. Within a couple of hours diarrhoea supervened, with copious and frequent stools, 12 to 20 being passed in the first 24 hours. Mild pyrexia was present in 10% of cases, but with one exception the temperature was normal again within 24 hours. Relapses were not seen, but reinfection occurred in two instances after a lapse of six to eight weeks.

A second outbreak of epidemic diarrhoea and vomiting occurred during December at the County Mental Hospital, Bodmin. The hospital accommodates 1,524 patients. The epidemic was confined to the female block, a large two-story building split into four wards, each of 60 patients. The first cases occurred in Wards 1 and 3 on Dec. 4, and between that date and the occurrence of the last case on Dec. 12, 27 patients were affected (Table II). The clinical picture was identical with the Redruth outbreak, though, owing to the high average age of the patients, manifestations were more severe, three deaths occurring from dehydration and collapse in patients, all of whom were over 75 years of age. Details of the dates of onset of disease are given in Table II.

TABLE II.—*Cases at Bodmin*

Ward	No. of Cases	Population at Risk	Attack Rate	Date of Occurrence
1, Female	17	60	28%	Dec. 4, 6, 6, 7, 7, 7, 9, 9, 9, 10, 10, 12, 12, 12, 12, 12, 12
2. ,,	Nil	60		
3. ,,	10	60	16·6%	Dec. 5, 5, 6, 6, 6, 9, 9, 9, 9, 12
4. ,,	Nil	60		

The hygiene in the institution was carefully investigated and found to be satisfactory. A central cookhouse supplies food for the hospital, the water is main supply, and the milk comes from the home farm. Samples of milk and water were taken, but results were negative. Numerous samples of stool and nasal swabs were taken from patients in both epidemics, but apart from two specimens containing Morgan's bacillus, and one from which *B. dysenteriae* (Flexner) was isolated, no pathological organisms were found. Agglutination to typhoid and salmonella groups was likewise negative.

In each epidemic routine measures for the prevention of spread of alimentary and upper respiratory tract infections were taken—namely, immediate isolation of patients, adequate ventilation and bed-spacing, and the wearing of masks by the nursing staff. Such simple measures appear to have been rewarded by very good results.

Comments and Conclusions

Perusal of the dates given in Tables I and II leads to the conclusion that the incubation period in the two outbreaks described was 72 hours, with a minimum of 48 hours and a maximum of four days. In both of the epidemics a high attack rate occurred in one or two wards, whereas adjacent wards in the same block were unaffected, in spite of the fact that all were supplied with identical food and water; further, all samples of food, milk, and water proved satisfactory. One must conclude that the infection is airborne and gains entry through either the upper respiratory tract or the gastro-intestinal tract—probably the latter, as

signs of involvement of the fauces are not frequent. The disease attacks all ages, and usually follows a mild course, though among the aged symptoms are more serious and the disease may prove fatal.

Literature and Discussion

The first recorded outbreak of epidemic nausea and vomiting in Britain occurred in 1936, when Miller and Raven (1936) described an epidemic in a girls' boarding-school in Thanet. Since this date at least four epidemics of a similar type have been recorded. In order to facilitate the comparison of the epidemiology and symptoms of these outbreaks I have tabulated the salient features (Table III).

TABLE III.—*Details of Outbreaks on Record*

Nomenclature of Epidemic	Gray (1939)	Smith and Davies (1941)	Bradley (1943)	Sakula (1943)	Brown *et al.*		Reimann, Hodges, and Price (1945)	Cornwall Epidemics
	Epidemic Nausea and Vomiting	Acute Gastro-enteritis	Epidemic Nausea and Vomiting	Gastro-enteritis in newborn	Epidemic Diarrhoea and Vomiting		Epidemic Diarrhoea, Nausea, and Vomiting	Epidemic Diarrhoea and Vomiting
					Adults	Babies		
Season	Autumn	Autumn	Autumn	Autumn	Spring		Autumn	Spring, autumn
Age most affected	Children	Troops	Young adults	Babies, average age 13 days	Young adults	Babies 0–3 months	Children and young adults mostly	Adults
Endemic in population	Yes	Yes	Yes	No	Yes	—	Yes	Yes
Mode of transmission	"Presumably a droplet infection"	Probably direct contact	Communicable disease; portal of entry upper respiratory tract	? Feeding-bottles	—	—	Probably air-borne; hand-to-mouth spread cannot be excluded	Air-borne infection
Incubation period	At least 48 hrs.	1½–7 days	2–7 days	—	4 days	—	2 days; extremes 30 hrs.–7 days	3 days. Extremes 2–4 days
Prodromal symptoms	—	Shivering and malaise	Nausea	Nil	Nil		Nil	Nil
Initial symptom	Nausea and vomiting	Vomiting	Vomiting	Vomiting	Abdominal pain, diarrhoea	Diarrhoea	Abdominal discomfort, nausea, diarrhoea	Vomiting, abdominal pain
Nausea and anorexia	Prominent symptom		Present in 20%	—	Present in 8%	—	Present in 75%	Present in 9%
Abdominal pain	—	"Feeling of heaviness"	Epigastric pain fairly frequent; no colic	—	Lower abdominal pain with 50% colic	—	Abdominal discomfort in 43%	Lower abdomen and colic
Vomit	Yes; in 90%	Forceful in 75%	Projected; 51%	Severe	Yes; 47%	Yes; 18·2%	Yes; 48%	Yes; 50%
Diarrhoea	Rare in children, frequent in adults	Yes; 93%	Of minor importance; 23%	Severe	Yes; 100%		Yes; 85%	Yes; 94%
Vertigo	Common symptom "sea-sick"	—	Dizziness present	—	No	No	Yes; 7%	Rare; 4%
Headache	Frontal headache in a few cases	—	Frontal headache invariably present	—	Yes; 11%	—	Yes; 66% frontal	Frontal headache in 10%
Pyrexia	Mild pyrexia in 12% school-children	Mild pyrexia	Mild pyrexia, but seldom above 100° F. (37·8° C.)	Mild; only one case over 100° F.	Mild pyrexia in 34%	Nil	—	Mild pyrexia in 25%
Pulse	Occasional bradycardia	—	Bradycardia not met with	—	—	—	—	—
Collapse—dehydration	—	—	—	Yes	Two cases of collapse responded well		—	Collapse in elderly patients, 3 deaths
Fauces	—	Infected	Resemble early stage of streptococcal throat; swabs negative	—	Not infected		Infected in 20–30%	Not infected; swabs negative
Agglutinations							Negative	Negative
Organisms isolated	Nil	Nil	Nil	*Ps. pyocyanea* in 44%	Nil		Nil	Nil
Most prominent symptom	Vomit	Forceful vomit followed by diarrhoea	Forceful vomit	Diarrhoea	Diarrhoea	Diarrhoea	Diarrhoea	Diarrhoea
Severity of symptoms	Mild	Mild	Mild	15 deaths; 83% mortality	Mild	Mild	—	Mild, but severe in old age
Average duration	3 days				4–6 days	3 days		3 days
Relapses			A few cases. After one week		Nil	Nil		Nil
Babies affected	No	No	No	Yes		Yes	No	No

It will be seen that epidemics described under the headings of epidemic nausea and vomiting, acute gastro-enteritis, and epidemic diarrhoea and vomiting possess many points of similarity. They have seasonal incidence in spring and autumn, an incubation period of 48 to 72 hours, and symptoms are of an afebrile gastro-intestinal infection, mild in nature, lasting three or four days and attacking in the main children and young adults. With the exception of the outbreak at Bodmin, described above, no fatal cases have been reported.

It is highly probable that all these cases were caused by the same organism. The slight variations in the symptoms themselves and the order of their predominance in different epidemics may be accounted for by the different age groups affected, the season of the year, and the well-known existence of closely related but slightly different strains of the organism. The endemic distribution with periodic exacerbations into mild widespread epidemics, the short incubation period, and the absence of sustained immunity strongly resemble the behaviour of the common cold or influenza, so that it seems probable that a virus will be found to be the causative organism. Reimann *et al.* (1945) were unable to transmit the disease to animals or to isolate a filtrable agent, but they obtained results strongly suggesting that the disease could be communicated to human volunteers by the inhalation of a fine mist of nasopharyngeal washings or stools from patients. The evidence that epidemic diarrhoea and vomiting of newborn babies is not caused by the same organism as that in adults is strong. Babies were involved in two of the six epidemics reviewed above. The first was an epidemic outbreak of diarrhoea and vomiting in a general hospital; the patients affected were for the most part adults, but the disease spread to two of the three babies' wards, 37 mothers and 22 babies contracting the disease. In their description of the epidemic Brown *et al.* (1945) state: "It was soon apparent in respect of the young babies that this outbreak

in no way resembled in severity a previous epidemic of neonatal diarrhoea which had occurred in the maternity wards at the beginning of the year, and which had been associated with a high mortality. Moreover, on that occasion no adults had been involved." The second, described by Sakula (1943), is a typical outbreak of diarrhoea and vomiting occurring in newborn babies, with a case mortality of over 80%.

The clinical distinction between these two epidemics, both involving babies, is obvious. Further evidence against the association of the two diseases is supplied by the infant mortality rate for diarrhoea and vomiting in Cornwall. Throughout 1946 a widespread outbreak of diarrhoea and vomiting was prevalent among the adult population. Yet the infant mortality from diarrhoea and vomiting for 1946 is the lowest for some years, being 1.7 per 1,000 live births.

Summary

Two outbreaks of diarrhoea and vomiting occurring at two county institutions in Cornwall during 1946 are described. These outbreaks were part of a widespread epidemic among the surrounding population. With the exception of three deaths, all in aged patients, symptoms were mild and conformed to previous epidemics reported in the literature, a summary of which is included. Evidence obtained from these Cornish outbreaks points to an air-borne disease with an incubation period of 72 hours, the portal of entry being either the upper respiratory or the gastro-intestinal tract; the organism is probably a virus. The relation between epidemic diarrhoea and vomiting in adults and that which occurs in newborn babies is discussed; the evidence points to the two conditions having a separate aetiology.

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FATAL POISONING BY "LETHANE" INSECTICIDE

BY

C. V. HARRISON, M.D., B.Sc.

The following case is recorded in the belief that it is the first example of fatal poisoning by lethane insecticide.

Case Report

A woman of 35 was found unconscious in a chair, breathing heavily. She had vomited and there was an empty bottle of "semprolia" lethane insecticide near by. It was subsequently discovered that she was a widow and had been ailing with abdominal symptoms for some time and, being too ill to work, was nearly destitute. She was immediately transferred to hospital, but on arrival was found to be dead.

The relevant necropsy findings were as follows. The face was more pink than usual. The right side of the heart was dilated and the internal organs were moderately congested. The mouth and oesophagus were healthy. The stomach contained a little oily fluid with a strong odour of oil of citronella like that of the bottle found by her. There were numerous pin-point petechiae running together into clusters, mainly along the lesser curvature of the stomach but spreading out on to the adjacent walls. There were similar but less severe petechiae in the duodenum. The appendix was the seat of a well-localized abscess containing approximately 5 ml. of pus; this was presumably the cause of the abdominal symptoms. The liver was acutely congested and had the same odour as the stomach contents. There was an excess of frothy mucus in the trachea and major bronchi and some oedema of the right lung. In addition both lungs showed extensive petechiae running together to form ecchymoses under the pleurae of the lower parts. All other organs appeared healthy.

Microscopically the liver contained a trace of fat and had collections of inflammatory cells in most of the portal tracts. Other organs showed no definite abnormality. The central nervous system was examined particularly for evidence of nerve-cell damage, and some swelling of the cells and loss of Nissl granules was noted, especially just lateral to the fourth ventricle; but as the necropsy was carried out 16 hours after death it was not possible to be certain that these were not autolytic changes.

Comment

The empty bottle found near the patient was of 55-ml. capacity. It had contained an insecticidal hair-oil, the composition of which was given on the label as: lethane 384 special, 49%; light petroleum, 49%; oil of citronella, 2%. Lethane 384 special consists of 12.5% of lethane 384 (N-butyl carbitol thiocyanate), 37.5% of lauryl thiocyanate, and 50% light petroleum. A 55-ml. bottle would therefore contain 3.5 ml. of N-butyl carbitol thiocyanate and 10.3 ml. of lauryl thiocyanate. The patient was judged to be about 8 st. (50 kg.), and, assuming that she took the whole contents of the bottle, the dose would be 0.07 ml./kg. of lethane 384 and 0.206 ml./kg. of lauryl thiocyanate.

Cameron *et al.* (1939), who studied the toxicity of these two drugs in rats, rabbits, and guinea-pigs by subcutaneous and intraperitoneal injection, found that the minimal lethal dose of lethane 384 was between 0.025 and 0.2 ml./kg. and of lauryl thiocyanate between 0.08 and 10 ml./kg. In the case of both drugs, therefore, the maximum dose which could have been taken by the patient lay within the range of lethal doses observed by Cameron. In fact, the effective dose taken was less than that stated above, because some was lost by vomiting, and, further, we were unable to discover whether the bottle was full. Even if the effective dose was as little as one-half of the maximum possible, the lethal dose for each drug still lies within the ranges observed by Cameron.

Cameron failed to observe any characteristic post-mortem lesions in his experimental animals, but concluded from clinical observation that death was due to respiratory failure, probably nervous in origin. We have similarly failed to find any characteristic lesion. The dilated right heart, congested viscera, and pleural petechiae suggest that death was due to respiratory failure. The petechiae in the stomach were presumably due to simple irritation, and the inflammatory changes in the liver were almost certainly secondary to the appendix abscess.

The particular preparation which proved fatal in this case can be bought at any chemist's shop and is not labelled "poison." It is marked with the words "For external use only" in print measuring 20 letters to the inch, followed by the words "Not to be taken" in print measuring 24 letters to the inch.

In view of the toxicity of lethane insecticide as evidenced by the present case it seems highly desirable that such preparations should be clearly labelled "Poison."

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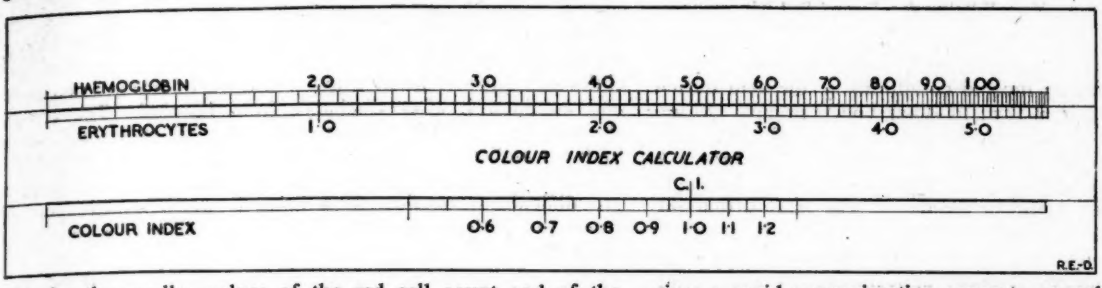
The Ministry of Food expects to be in a position to distribute small quantities of imported citric acid, and proposes to allocate supplies direct to such importers as can establish their claim to having engaged in this trade in the years immediately preceding the war. Importers who wish to participate in this scheme should apply for full details to the Ministry of Food, Miscellaneous Food Products Division, 39, Portman Square, London, W.1.

Medical Memoranda

Caiculation of the Colour Index

Freedman (1946) describes a nomogram for the calculation of the colour index. Such nomograms are not new, having been described by Warburg (1927), Haden (1940), and others. Nomograms of this type suffer from one particular disadvantage in that, for the smaller values of the red cell count and of the haemoglobin, the ruler makes an acute angle with the recording line, and the result becomes difficult to read. This can be obviated by the use of logarithmic scales for the haemoglobin and red cell values, in which case the colour index line will be parallel to the others.

Other methods of rapidly calculating the colour index have been devised, notably that of Symons (1936), which is, in effect, a slide rule with the B scale reversed. In its original form it made provision for a variable erythrocyte standard, but this is unnecessary and confuses the issue. A modified form of this rule (see diagram) has been in use in this laboratory for many years. To use the rule, the value of the erythrocyte count is set against the haemoglobin value, and the arrow then points to the colour index. It is only a matter of arithmetic to make up a complete series of tables giving the colour index for varying erythrocyte and haemoglobin values, but such a set of tables is cumbersome in use. The appended table gives a rapid approximation accurate enough for clinical work. In general, however, one finds that where the calculation of the colour index is not done in the head the slide rule is the more popular.



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Colour Index

	0·50	0·55	0·60	0·65	0·70	0·75	0·80	0·85	0·90	0·95	1·00	1·05	1·10	1·15	1·20	1·25
1·0	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1·1	11	12	13	14	15	16	18	19	20	21	22	23	24	25	26	27
1·2	12	13	14	15	17	18	19	20	21	23	24	25	26	27	29	30
1·3	13	14	15	17	18	19	21	22	23	25	26	27	28	30	31	32
1·4	14	15	17	18	19	21	22	24	25	26	28	29	31	32	33	35
1·5	15	16	18	19	21	22	24	25	27	28	30	31	33	34	36	37
1·6	16	17	19	20	22	24	25	27	28	30	32	33	35	36	38	40
1·7	17	18	20	22	23	25	27	29	30	32	34	35	37	39	40	42
1·8	18	19	21	23	25	27	28	30	32	34	35	37	39	41	43	45
1·9	19	20	22	24	26	28	30	32	34	36	38	39	41	43	45	47
2·0	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49
2·1	20	23	25	27	29	31	33	35	37	39	41	44	46	48	50	52
2·2	21	24	26	28	30	32	35	37	39	41	43	46	48	50	52	54
2·3	22	25	27	29	32	34	36	38	41	43	45	48	50	52	55	57
2·4	23	26	28	30	33	35	38	40	42	45	47	50	52	54	57	59
2·5	24	27	29	32	34	37	39	42	44	47	49	52	54	57	59	62
2·6	25	28	30	33	36	38	41	43	46	49	51	54	56	59	62	64
2·7	26	29	32	34	37	40	42	45	48	50	53	56	59	61	64	67
2·8	27	30	33	35	38	41	44	47	49	52	55	58	61	63	66	69
2·9	28	31	34	37	40	43	45	48	51	54	57	60	63	66	69	72
3·0	29	32	35	38	41	44	47	50	53	56	59	62	65	68	71	74
3·1	30	33	36	39	42	45	49	52	55	58	61	64	67	70	73	76
3·2	31	34	37	40	44	47	50	53	56	60	63	66	69	72	76	79
3·3	32	35	38	42	45	48	52	55	58	61	65	68	71	75	78	81
3·4	33	36	40	43	46	50	53	57	60	63	67	70	74	77	80	84
3·5	34	37	41	44	48	51	55	58	62	65	69	72	76	79	82	86
3·6	35	38	42	45	49	53	56	60	63	67	71	74	78	81	85	89
3·7	36	39	43	47	50	54	58	61	65	69	73	76	80	84	87	91
3·8	37	40	44	48	52	56	59	63	67	71	75	78	82	86	90	94
3·9	38	41	45	49	53	57	61	65	69	73	77	80	84	88	92	96
4·0	38	42	46	50	54	58	62	66	70	74	78	82	86	90	94	98
4·1	39	44	48	52	56	60	64	68	72	76	80	84	89	93	97	101
4·2	40	45	49	53	57	61	66	70	74	78	82	87	91	95	99	103
4·3	41	46	50	54	59	63	67	71	76	80	84	89	93	97	102	106
4·4	42	47	51	55	60	64	69	73	77	82	86	91	95	99	104	108
4·5	43	48	52	57	61	66	70	75	79	84	88	93	97	102	106	111
4·6	44	49	53	58	63	67	72	76	81	86	90	95	99	104	109	113
4·7	45	50	54	59	64	69	73	78	83	87	92	97	101	106	111	116
4·8	46	51	56	60	65	70	75	80	84	89	94	99	104	108	113	118
4·9	47	52	57	62	67	72	76	81	86	91	96	101	106	111	116	121
5·0	48	53	58	63	68	73	78	83	88	93	98	103	108	113	118	123
5·1	49	54	59	64	69	74	80	85	90	95	100	105	110	115	120	125
5·2	50	55	60	65	71	76	81	86	91	97	102	107	112	117	123	128
5·3	51	56	61	67	72	77	83	88	93	99	104	109	114	120	125	130
5·4	52	57	63	68	73	79	84	90	95	100	106	111	117	122	127	133
5·5	53	58	64	69	75	80	86	91	97	102	108	113	119	124	130	135
5·6	54	59	65	70	76	82	87	93	98	104	110	115	121	126	132	138
5·7	55	60	66	72	77	83	89	94	100	106	112	117	123	129	134	140
5·8	56	61	67	73	79	85	90	96	102	108	114	119	125	131	137	143
5·9	57	63	69	75	81	87	93	99	105	111	117	122	128	134	140	146
6·0	57	63	69	75	81	87	93	99	105	111	117	123	129	135	141	147
	0·50	0·55	0·60	0·65	0·70	0·75	0·80	0·85	0·90	0·95	1·00	1·05	1·10	1·15	1·20	1·25

To use the table, find the erythrocyte count in the left-hand column, and follow that line across to the observed haemoglobin or figure below. At the head and foot of the column will be found the colour index calculated to the nearest 0·05.

Reviews

ATLAS FOR DERMATOLOGISTS

Atlas of Histopathology of the Skin. By G. H. Percival, M.D., F.R.C.P.Ed., A. Murray Drennan, M.D., F.R.C.P.Ed., and T. C. Dodds, F.I.M.L.T., F.R.P.S. (Pp. 494; 376 photomicrographs in colour. 75s.) Edinburgh: E. and S. Livingstone. 1947.

Owing to its accessibility, it is easier to make microscopical preparations to illustrate morbid conditions of the skin during the lifetime of the patient than of other bodily organs. Moreover the numerous morbid conditions that may affect the skin make possible a wide variety of microscopical pictures. A comprehensive atlas of the histology of skin diseases might therefore be an enormous undertaking were it not that the clinical picture is often more distinctive than that revealed on microscopical examination, for it is not uncommon for eruptions presenting different clinical appearances to show very similar histopathological changes.

The authors have produced a very good book. There are 370 figures, almost all in colour, the first group illustrating the normal skin and its appendages in about 20 figures, the remainder constituting a fairly complete atlas of cutaneous histopathology, and including figures of most of the important animal parasites common in the British Isles. The authors have not included any figures of the pathogenic fungi, although there are illustrations of the pathological changes which these fungi cause. This atlas, a product of the Edinburgh School, illustrates British dermatology, and the authors, who have been assisted by many British dermatologists, have barely drawn upon the rich material provided by the Tropics, but there are illustrations of several of the tropical skin-infesting insects and of Oriental sore and leprosy.

We may question whether colour photography is yet able to yield illustrations equal to those provided by the artist skilled with pen and brush. In this volume the colour illustrations have been made by the Finlay process, which is generally admitted to be the best method of reproducing colour photographs, and though the illustrations are as good as any we have seen, this process is yet far from perfect. It appears to accentuate the blues and purples unduly and to attenuate the reds. Most of the sections illustrated here were stained with haemalum and eosin and the Finlay process does not appear to do justice to them, in some instances giving them a muddy appearance. On the other hand the definition of those (not so numerous) prepared with iron haematoxylin and the van Gieson process is clearer, and the sections prepared to show elastic tissue are also good. One of the best illustrations—figure 20—shows nerve fibres impregnated with silver ending in a Meissner corpuscle.

The authors have accomplished a difficult task with skill. As they themselves say, this work is not intended for the general medical public but primarily for those interested in the specialty of dermatology, and every dermatologist should study it. The general pathologist, however, will find it useful in helping him to solve his occasional dermatological riddles.

H. HALDIN-DAVIS.

GROUP PSYCHOTHERAPY

Group Psychotherapy. Theory and Practice. By J. W. Klapman, M.D. (Pp. 344. 21s.) London: William Heinemann (Medical Books). 1946.

During the war the necessity of treating large numbers of patients suffering from not very deep-seated psychoneuroses led to renewed attempts to practise group therapy. This had been tried in the 1914–18 war but fell into disuse with the insistence on complete analysis and catharsis of each patient. The author of this book surveys the subject of group psychotherapy and suggests that too much stress may have been laid on the patient's emotions, and that much can be done by encouraging him to use his intelligence. Moreover in group therapy a transference may be obtained to both the therapist and other members of the group, causing an extraverted attitude in the patient, which often arouses his interest and makes him desire individual therapy when that is necessary (as it generally is) in addition to group therapy.

Lectures can teach the patient the nature of his illness, and discussion by the group of anonymous case histories, often of members of the group, may give him some insight into his own condition. These methods are suitable for treating groups of mild schizophrenics in mental hospitals; and groups of patients with other types of mental illness, out-patients or even private patients, may be organized. Some authorities favour set lectures; others discussions, psychodrama, or puppetry; and play therapy with children is commonly practised. The author stresses the advantages of group therapy among mothers and children. Patients often enjoy this form of group intercourse and continue it after discharge from hospital. The groups should usually be of 7–10 persons, but some therapists lecture to large audiences. The book includes a schedule of lectures as well as the author's impressions of results; accurate statistics are difficult to obtain. This book is worth studying by all concerned with the treatment of mental illness, especially in institutions.

R. G. GORDON.

OPHTHALMOLOGY

Principles of the Contact Lens. By H. Treissman, F.R.C.S., D.O.M.S., and E. A. Plaice. (Pp. 88; 40 illustrations. 10s. 6d.) London: Henry Kimpton. 1946.

L'Ophtalmologie Du Praticien. By A. Cantonnet. (Pp. 172; 85 figures. 100 francs.) Paris: Librairie Maloine.

Principles of the Contact Lens is the first monograph on this topic with which an ophthalmic surgeon has been associated, and the account is therefore more strictly clinical than those that have come from opticians. The authors devote about a third of their short study to the historical and optical aspects of the contact lens, and then discuss the value of contact lenses in neuroparalytic keratitis, trichiasis, macular lesions, ptosis, symblepharon, and pemphigus of the conjunctiva in addition to the more widely recognized uses. They describe two types of contact lens—the ground glass lens and the moulded glass lens—and mention plastic contact lenses towards the end of the book. The clinician should find particularly helpful the chapters dealing with the preliminary test, buffered solutions, and tolerance.

The second book is one of the "Petits Précis" series, edited by Dr. Cantonnet. It is a remarkably complete summary of elementary ophthalmology and contains some matter not generally found in similar volumes, such as a fairly full account of binocular vision, the Cantonnet-Nouet alphabet for the blind, and a section on ocular hygiene. The author discusses treatment rather dogmatically and sometimes differs from the practice in Britain.

ARNOLD SORSBY.

NATIONAL HEALTH SERVICE

Your Guide to the National Health Service. A Manual for Patients, Doctors, Civil Servants, Hospital Officers, and other Health Workers. By A. David Le Vay, M.S., F.R.C.S. (Pp. 78. 3s. 6d.) London: Hamish Hamilton Medical Books. 1946.

Though this book is said to be for doctors as well as for others interested it is doubtful if the former will find it very helpful, for, as the author indicates, the Act is merely a skeleton awaiting the flesh of Regulations; and most doctors who have studied it have found a good deal wrong with the skeleton. However, though the author is a convinced believer in the Act and its consequences, his book is worth reading; much of it is factual, and the style is clear and pleasant. Mr. Le Vay is aware that opinions may differ and his criticism is fair.

We may take exception to a few points: for example, why has the author paraded once more that platitude about the buying and selling of practices, which, he says, is "equivalent to the buying and selling of patients"? No one who has bought a practice in an area served by several doctors could make such an assertion except under the influence of political propaganda. It is stated emphatically that "the doctor will *not* be the servant of the State." Is this not playing with words? There is nothing derogatory about working in such a service, though most doctors would prefer to be employed

and paid by their patients; but when doctors have sold their practices to the State, when their incomes come mainly, or even wholly, directly or indirectly from the State, and when they can be excluded from the Service on the final decision of a Minister, it is not easy to understand in what sense they will retain their independence.

Certification is mentioned only briefly, but the author might have referred to the implications which many doctors see and fear in the future ubiquity and importance of medical certificates in connexion with the money benefits of National Insurance. Discussing expulsion from the Service and right of appeal to the courts the author very fairly marshals the arguments on both sides, but agrees that the Minister should have the last word. He sees no reason why the taking over of the hospitals should lessen local voluntary work and interest, and says, not perhaps with much conviction, "there is plenty of room in hospital life for voluntary help—the linen-rooms and the domestic side generally will remain open as before." He considers that "central ownership of hospitals is only the predecessor to decentralization and the encouragement of local independence"; and he concludes that "the Service will be very good or very bad," and whether it is good or bad "depends on whether there will be a tightening of bureaucratic control, and on the whole-hearted co-operation of the doctors." Yet how can anyone, with the embrace of post-war bureaucracy about him, hope for a slackening of its hold, fortified as it is in this case by the great powers given to the Minister and his staff. However, the optimist *may* be right. The book is honestly written, persuasive in tone, and not deliberately provocative.

ALFRED COX.

TEXTBOOK OF ALLERGY

Allergy. By Erich Urbach, M.D., and Philip M. Gottlieb, M.D. Second edition, revised and enlarged. (Pp. 968; 410 figures. 70s.) London: William Heinemann (Medical Books). 1946.

In the second edition the authors have revised and enlarged this book and added new sections on the psychosomatic aspects of allergy, the Rh factor, allergic bronchitis, allergic cough, and eosinophilic erythroedema. Of the 3,325 references almost 1,300 are new to this edition. The classification of the phenomena of hypersensitiveness—always a difficult problem—is rather involved. The authors' views on propeptan therapy, a form of treatment originated by the senior author, are far from being generally accepted by specialists in this field; and the dosage of pollen extract recommended in hay-fever is considerably lower than that usually prescribed in this country.

This excellent reference book, up to date and well constructed, is probably the most complete on allergy yet published. It will be welcomed by those especially concerned with the subject, and many chapters will interest all students of medicine, though the general physician may find it heavy going in parts.

D. A. WILLIAMS.

INCOME TAX

At Home with Income Tax. By R. W. Harris. (Pp. 178. 6s. 6d.) London: Stone and Cox. 1946.

The aim of this book is to provide the ordinary taxpayer, in a compact and readily accessible form, with a guide to the income tax, while avoiding complicated problems that are not of general interest. The author has succeeded to an extent quite unusual in this field. The general arrangement is excellent, the print clear, and the exposition simple (so far as simplicity is attainable in this subject) and illuminated by examples. The "Notes for Professional Men" and those dealing with expenses are as useful as a broad description permits; the importance of taking income tax into account in connexion with the terms on which a share in a practice changes hands will particularly interest medical practitioners. The author discusses P.A.Y.E. briefly, and mainly from the weekly wage earner's standpoint.

One of the hazards besetting this sort of book is that changes in the law are liable to make it out of date in a comparatively short time, but the fundamental features of the income tax, which are well explained here, are not likely to alter much. We can recommend it as the best available guide for "the ordinary man and woman" for whom it is intended.

BOOKS RECEIVED

[*Review is not precluded by notice here of books recently received*]

A Contribution to the Knowledge of the Influences of Gonadotropic and Sex Hormones on the Gonads of Rats. By J. H. Gaarenstroom and S. E. De Jongh. (Pp. 164. Florins 8.) New York and Amsterdam: Elsevier Publishing Company. 1946.

An account of experiments on sex hormones stressing the independent existence of two gonadotrophic hormones in each animal species.

Handbook of Elementary Anatomy. By John J. Teklenburg. (Pp. 16. 5s. 6d.) London: H. K. Lewis. 1947.

A book of coloured plates displaying human anatomy; intended for students of nursing and first aid.

The Birth of a Child. By Grantly Dick Read, M.A., M.D. (Pp. 99. 5s.) London: Heinemann. 1947.

The author expounds in simple terms his theory that the pain of labour can be countered by relaxation and education; for the midwife and general reader.

A Study on Oxygen Toxicity at Atmospheric Pressure. By W. T. L. Ohlsson. (Pp. 93. No price.) Lund, Sweden: Hakan Ohlsson. 1947.

A monograph on oxygen poisoning in man with an account of experimental investigation in animals.

Postgraduate Obstetrics. By W. F. Mengert, M.D. (Pp. 392. 25s.) London: Hamish Hamilton. 1947.

An American textbook of obstetrics intended for the general practitioner.

Parenteral Alimentation in Surgery. By Robert Elman, M.D. (Pp. 284. 21s.) London: Hamish Hamilton. 1947.

The author discusses the indications for and methods of parenteral administration of fluids, with special reference to amino-acids and proteins.

Anatomical Terms. By E. J. Field, M.D., M.S., and R. J. Harrison, M.A., M.B., B.Chir. (Pp. 165. 7s. 6d.) Cambridge: W. Heffer. 1947.

A pocket-book to help students to understand the etymology of anatomical terms.

The Care of Children from One to Five. By John Gibbens, M.B., M.R.C.P. 3rd ed. (Pp. 192. 5s.) London: J. and A. Churchill. 1947.

The third edition of this well-known book contains much new material, including a chapter on books and music and an appendix on the care of young children in the Tropics.

The Treatment of Diabetes Mellitus. By E. P. Joslin, A.M., M.D., Sc.D., *et al.* 8th ed. (Pp. 861. 50s.) London: Henry Kimpton. 1946.

A textbook on diabetes based on the experience of 29,000 diabetics and glycosurics.

The Physical Background of Perception. By E. D. Adrian, O.M., F.R.S. (Pp. 95. 10s.) Oxford: Oxford University Press. 1947.

A reprint of the author's Wayflete lectures delivered in 1946.

Elements of Surgery. By Fauset Welsh, B.Sc., M.B., F.R.C.S. (Pp. 83. 7s. 6d.) Oxford: Oxford University Press (Geoffrey Cumberlege). 1947.

An introduction to surgery intended for nurses and medical students.

The Microscope. Its Theory and Applications. By J. H. Wredden, F.R.M.S. (Pp. 296. 21s.) London: J. and A. Churchill. 1947.

A discussion of the optical principles, construction, and components of the microscope, with an account of photomicrography and of the preparation of specimens.

Child Health and Development. Edited by R. W. B. Ellis, O.B.E., M.D., F.R.C.P. (Pp. 364. 18s.) London: J. and A. Churchill. 1947.

The book is in two parts; the first deals with the physical, mental, and intellectual development of the normal child, and the second with the social service and conditions related to child health.

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THE EPIDEMIOLOGY OF TUBERCULOSIS

Prof. J. W. S. Blacklock, whose London University Lecture on the epidemiology of tuberculosis is printed in the opening pages of this issue of the *Journal*, has made two notable contributions to the study of this disease. The first of these, the report[1] on which is now a classic in the literature of its subject, was a combined morbid anatomical and bacteriological study of tuberculosis in children as seen post mortem during a seven-year period at the Royal Hospital for Sick Children, Glasgow. The former method of study made it possible to identify the site of the primary focus; the latter, since it included ascertainment of the type of tubercle bacillus, identified the source of the infection. The primary focus was abdominal in 101 cases; among tubercle bacilli isolated from such lesions, 54 strains were of bovine type and only 12 human. On the other hand, in 173 cases with a primary focus in the lung all but 3 strains (97.3%) of the bacilli isolated were of the human type. These observations, so unmistakable in their significance, did more than any others finally to refute the doctrine of von Behring and Calmette that the route of infection in infancy is almost exclusively alimentary, and that subsequent lung disease is due to migration of the bacilli from a glandular focus draining the alimentary tract. The extreme danger to young children of lung infection by direct inhalation was plainly revealed; indeed, in all but 5 of these 173 cases in which a primary thoracic lesion was found this infection was the cause of death. It appears that in Scotland this form of tuberculosis may have a higher mortality than elsewhere, but it is now more widely recognized as a highly fatal condition, particularly in the youngest age group. At the same time we have learned to look for the source of infection in pulmonary tuberculosis at all ages not in some reactivated glandular focus but in another case among the patient's recent household or other contacts.

This aspect of epidemiology is not forgotten in the lecture we print to-day. It is in fact amplified by a statement of the frequency with which different relatives in the household were found to be the source of an infection terminating in meningitis. But the greater part of the lecture deals with a fresh investigation pursued during the war on a considerably wider scale with the main object of determining the present relative frequency of infections due to the human and bovine types of tubercle bacillus. In this connexion, again, it is interesting to recollect that medical science was misled for years by false belief emanating from the most authoritative source. Koch himself denied the pathogenicity of the bovine type of tubercle bacillus for man, and this was fully recognized only after the publication of the Final Report of the British Royal Commission in 1911. It was not indeed until 1929 that the late W. T. Munro demonstrated the existence of human phthisis due to the bovine type of bacillus. Our present detailed knowledge of the frequency of infection from cattle derives mainly from the work of the late Stanley Griffith, and, since the majority of his type determinations of bacilli from different human lesions were made fifteen or more years ago, they do not necessarily reflect the conditions existing to-day. It is important to know how much tuberculosis is being produced by the consumption of infected milk, age and geographical distribution, and the forms which it assumes. Such information is here made fully available for Scotland during the years 1943–4. The results acquire their chief interest when analysed geographically. It is shown, more clearly perhaps than ever before, that human infection with the bovine type of tubercle bacillus is a disease of rural areas where milk is consumed raw, and uncommon in cities where almost all milk is heat-treated, if not pasteurized under licence. Thus the percentage of bovine infections in cervical adenitis was 46.2 in the towns and 77.8 in the country; the corresponding figures for cerebral tuberculosis were 20 and 42, and for surgical 20.1 and 45.4. It is even possible to relate the frequency of infections of bovine origin in various rural areas to the known condition of their cattle. In the Western area, including Ayrshire, where a large proportion of the herds are attested, bovine bacilli are much less often the cause of human disease than in parts of Scotland with a less enviable dairy-farming record.

An interesting corollary to this study is the work of J. Sigurdsson,[2] pursued during the same period but under the shadow of German occupation in Denmark. This work involved, among other things, detailed inquiries and clinical investigations among families living in widely scattered and isolated farms. The author modestly remarks that his only means of transport for these extensive rural travels was a "bike." Denmark has made considerable progress towards the eradication of tuberculosis in cattle; a policy of permissive and compensated slaughter has been pursued since 1932, and many areas are free from the disease. On the other hand, others remain where it is still common, and owing to the thorough system of veterinary control the condition from this point of view of every area, and indeed apparently of every farm, is known. Sigurdsson's principal material consists of 566 type-determined cases of pulmonary tuberculosis or pleurisy, of which 165 came from rural areas. No fewer than 67 of these 165 (40.6%) were infected with the bovine type of tubercle bacillus—quite the highest proportion ever observed—whereas in only 3.6% of the 362 purely urban patients was this type of infection found. The novel feature of this investigation follows: it consisted of pursuing inquiries into the records of the cattle with which the rural cases had been in contact. The result was to show that no less than 94% of the patients who had

[1] *Tuberculous Disease in Children.* Med. Res. Cncl. Sp. Rep. Ser. No. 172, 1932. London.

[2] *Acta tuberc. scand.*, 1945, Suppl. XV.

an infection of bovine type had been in contact with "strongly tuberculous" cattle within the past two years. Sigurdsson is convinced that the inhalation of bacilli in stables containing animals with pulmonary disease is the main cause of these infections. Support for this contention is afforded by the sex frequency, males being more affected and more occupied than women in stable work, and by the demonstration of living tubercle bacilli in the dust and dirt of such stables. His further observations consisted of examining all members of the households of 200 farms in the parish of Grimstrup, at one half of which all the cattle were negative tuberculin reactors, whereas in the remainder they were "strongly tuberculous." Whether judged by the tuberculin reaction or by clinical or radiographic evidence of disease, households in the second category showed the higher percentage of infection. In many of these cases the route was doubtless alimentary. There are many other points of interest in this extensive study, which includes a comprehensive review of other—particularly Scandinavian—work. The author is convinced, for instance, that the prognosis is no better when human phthisis is due to the bovine instead of the human bacillus. He shows that the bovine type may spread from man to man, and from man to cattle, as well as from cattle to man. But the chief importance of his work is in showing the danger to human beings not only of consuming infected milk but of contact with infected animals in the stable. Evidence of direct infection from cow to man was also provided in this *Journal*[3] three years ago by L. J. Cutbill and A. Lynn, of the Cheshire Joint Sanatorium. That infection by inhalation may occur in these circumstances has certainly not been generally recognized, and the risk is one with which farming people should be made familiar.

OXYGEN POISONING

As men descended to ever greater depths under water a number of symptoms were observed whose causes were gradually disentangled. The most important were those due to bubble formation on decompression. These can be prevented by a suitable time-table for ascent in stages. However, other symptoms are most marked while air at high pressure is being breathed. They are probably due to the fact that all gases are poisonous if breathed at sufficiently high pressure. Many solids and liquids are not poisonous, for the good reason that the blood does not dissolve them in toxic quantities. But the amount of a gas taken up is proportional to its partial pressure. Behnke and his colleagues made the very remarkable discovery that not only nitrogen but argon is a mild narcotic at high pressures. What is even more surprising is that, per weight absorbed, nitrogen and argon are just about as narcotic as nitrous oxide. When breathing air at a depth of 300 feet—that is to say under 10 atmospheres pressure—a diver is exposed to a partial pressure of nearly eight atmospheres of nitrogen. Nitrous oxide is about forty times as soluble in blood as nitrogen, so the diver absorbs about the same volume of nitrogen per minute as he would of nitrous oxide at atmospheric pressure from a mixture containing 20% of this gas. He does not lose consciousness, but becomes rather stupid and irresponsible. Nitrous oxide and ether may be two or three times as narcotic as nitrogen per weight absorbed. They are certainly not five times as narcotic. They are more efficient as anaesthetics because they are more soluble, both in water and in lipoids, and for no other reason. Hydrogen and helium are not appreciably narcotic at ten atmospheres pressure. They may well be so at fifty or a hundred atmospheres.

Many gases have a marked physiological effect at pressures considerably below that at which they could be expected to have any narcotic action. One of these is oxygen. The experiments which K. W. Donald described in the last and the present issues of the *Journal* were a part of the preparation for attacks on enemy ships, such as the *Tirpitz*, carried out by small groups of divers. Oxygen has a double advantage for such work. Not only need a diver carry far less oxygen than air for a given stay under water, but he need not betray his presence by bubbling. If air is used, all the nitrogen in it must be discharged as tell-tale bubbles. But a well-trained man can use up almost all his oxygen if this gas is supplied in a pure state. It had been known since Paul Bert's work of 1878 that oxygen is a convulsant when breathed at high pressures. But up till 1942 there were no quantitative data as to its effects on men. Dr. Donald describes the work carried out by the Admiralty Experimental Diving Unit in 1942 to 1944. Not only were large numbers of men subjected to high-pressure oxygen both in compressed air and under water, but repeated experiments were done on the same individual. As it is perhaps unlikely that the work will ever be repeated on so large a scale, it is to be hoped that the data will be published in full, so that a complete statistical analysis is possible. From a practical point of view the most important conclusions reached were the extreme variability of tolerance, both between different individuals and in the same man from day to day, and the far lower tolerance under water than in compressed air. Convulsions have occurred at a depth of only 40 feet. Thus J. S. Haldane's "misconception" which led him to recommend that oxygen should not be used at pressures exceeding two atmospheres absolute, or 33 feet of sea water, would seem to have been justified by practical experience. Under war conditions it can be, and has been, breathed at greater depths. A one per cent chance of convulsions is a small additional risk to a man who intends to fix a mine under an enemy battleship. But it is not a risk which should be taken in peacetime.

Apart from the work described by Donald, a number of experiments were done on civilian personnel. When their results are published, while Donald's main conclusions are not likely to be shaken, some of them may be seen in a slightly different perspective. In particular the irritant effect of oxygen on the respiratory tract will perhaps appear to be a limiting factor in certain types of dive, though it was not so in those investigated by him. In spite of the careful biochemical work of Dickens, the cause of oxygen convulsions is completely obscure. The first requisite for its elucidation will be the measurement of the partial

[3] *British Medical Journal*, 1944, 1, 283.

pressure of oxygen in the venous blood leaving the brain just before a convulsion. Recent technical advances render such a measurement entirely possible even in human subjects, let alone animals. If the partial pressure of oxygen in the brain just before a convulsion is found to be several atmospheres, then it is possible that the inactivation of enzymes which Dickens reports may be a causative factor. If, on the other hand, the partial pressure does not always rise above half an atmosphere some other cause will have to be sought. In any case research on this problem will clear up the question of how far the brain can protect itself from oxygen poisoning by vaso-constriction, and thus throw further light on the fundamental problem of the control of cerebral circulation. Whatever the biochemical process behind oxygen convulsions it is likely to be simpler than that behind convulsions caused, say, by metrazol or picrotoxin; and, above all, it is more likely to throw light on the causation of epilepsy. The research in question shows clearly both the good and the bad points of much research done in connexion with the war. On the one hand quantitative data were obtained on men on a scale which has so far been quite impossible in peacetime. On the other hand, on account of the urgency of the practical problems in view, it was impossible to investigate the physiological processes at work in full detail. As a field for further research oxygen poisoning remains wide open, but unfortunately the technical equipment needed is rather expensive.

Similar problems could and should be tackled in peacetime. For example, the vapours of various solvents cause a good deal of ill-health and occasional deaths. But we do not know whether it would be possible to lower the risk by eliminating specially susceptible workers, as is the case with oxygen poisoning. Again, the inhalation of textile dusts is a steady source of death from nephritis and a group of conditions whose common factor is hyperpiesia. We know nothing of the biochemical processes at work, which should clearly be studied in animals before any experiments are done on men. Industry is as important as war, being indeed a prerequisite for modern war. If work on a similar scale to that of the Admiralty Experimental Diving Unit is done in the industrial field in the next generation, British industry may become a model of hygiene to the world in the twentieth century, as it was a model of productive efficiency in the nineteenth.

PLASMA MEPACRINE RECONSIDERED

The control of chemotherapeutic remedies by estimations of their concentration in the blood first came into general use in the case of the sulphonamides, following the work of Marshall and his colleagues. The methods applied were simple and the procedure became popular, especially in the United States where at one stage of the war it was reported that all the scientific medical men were "blood-level-minded." Accordingly, in 1942, when mepacrine (atebrin, quinacrine) began to be used to control malaria, it was natural that one of the first steps should be the study of its concentration in the different body fluids. Appropriate methods for this purpose were devised by Brodie and Udenfriend and by Masen, based on the extraction of the mepacrine by ethylene dichloride with suitable adjustments of the *p*H and measurement of the fluorescence of the material obtained. The question was studied by Shannon[1] and by many other American and British workers.

Sulphonamides are distributed approximately equally through most of the body fluids and tissues. Mepacrine behaves quite differently, since it has a high affinity for protein and for certain types of cells. Most of the mepacrine is stored in the tissues and only a small proportion is found in the blood. The concentration in the skin is approximately 80 times that of the blood, in the muscle 50 times, and in the liver 2,000 times. In the blood itself distribution is uneven. The concentration in the erythrocytes is up to twice that of the plasma, and in the leucocytes over 200 times. The concentration in whole blood is approximately four times as great as that in the plasma. Finally, of the mepacrine in the plasma 80–90% is bound to plasma proteins and 10–20% is dissolved in plasma water; presumably it is this last fraction which is in equilibrium with the mepacrine in the tissues. In view of this complex distribution there was much discussion during the war as to which concentration of mepacrine—in plasma, in blood, or in some other fluid—was the most important. On the authority of Shannon and his colleagues it was generally agreed that plasma mepacrine was the most reliable indication of the level of mepacrine in the other tissues of the body. A great deal of work was done on this assumption—for example, the extensive observations made on volunteers at Fort Knox,[2] and all aspects of the dosage of mepacrine and of its suppressive and therapeutic actions against malaria were related to plasma mepacrine levels.

The whole basis of this work has now been questioned in a recent paper by Marshall and Dearborn, working in the laboratory which launched "blood concentrations" into modern therapeutics. They studied the therapeutic action of mepacrine in the malaria produced in ducks by *Plasmodium lophurae*, the host-parasite combination which has been most widely used in recent American laboratory work on malaria. Ducks maintained on a constant daily dosage of mepacrine showed marked variations in the plasma concentration of mepacrine, both between different ducks and in the same duck on different days. These variations are due mainly to variations in the distribution ratio between plasma and tissues, most of the compound being stored in the latter. (Although not mentioned by Marshall, much of this variation might well be due to changes in the level of ammonium ions, since even low concentrations greatly influence the distribution of mepacrine between cells and body fluids.[3 4]) The concentrations of mepacrine in the tissues and in the erythrocytes were much less variable than those of the plasma. There was little or no correlation between plasma concentration and therapeutic effect, but there was good correlation between dosage and therapeutic effect. Although this work has still to be confirmed, and it remains to be shown that what happens in ducks also happens in man, this paper calls for reconsideration of the basic assumptions of investigations on mepacrine. It does not invalidate all studies of the concentrations of drugs in body fluids; it merely points out that in the case of mepacrine the plasma concentration is not such a reliable indicator as was previously believed. In that case there might be much to be said for going back to the estimation of its concentration in whole blood, taking precautions to check the leucocyte count. The whole blood concentration is much easier to measure than the concentration in the plasma; it can be done by a simple, portable, and cheap instrument described by King and Gilchrist.[5] However, mepacrine is rapidly becoming out of date. From

1 *J. Pharmacol.*, 1944, **81**, 307.
2 *Arch. intern. Med.*, 1946, **78**, 64.
3 *Ann. trop. Med. Parasit.*, 1945, **39**, 53.
4 *J. clin. Invest.*, 1946, **25**, 694.
5 *Lancet*, 1945, **1**, 814.

1942–5 it was of enormous military importance in controlling malaria in the Pacific and Mediterranean areas. It will now be replaced gradually by paludrine, chloroquine, or other new antimalarials yet to be discovered. So perhaps this challenge to accepted beliefs will not necessitate as much revision of previous work as would otherwise have been the case.

A minor point of some interest is illuminated by Marshall and Dearborn's paper—namely, to what extent the substance present in the blood or tissues is unchanged mepacrine and to what extent it is merely an inactive degradation product. Taggart has studied material from Marshall's ducks. He reports that of the fluorescent material obtained from the liver one day after a single dose, 90% is unchanged mepacrine; but 14 days after a single dose only 15% of the fluorescent material is really mepacrine and 85% consists of degradation products, which are presumably inactive. Once again it has been shown that the application of analytical chemistry to therapeutics is beset with pitfalls and that a broad and balanced judgment is needed properly to assess the valuable contributions that can be made to clinical practice by these measurements.

VACCINIA AND ECTROMELIA

In 1941 Hirst[1] and McClelland and Hare[2] described the agglutination of chicken red-blood cells by material containing influenza viruses A and B. Since that time Burnet and his co-workers[3-8] have applied this new technique to the study of a large number of viruses, and similar types of reaction have been given by viruses previously considered to be unrelated. Specific agglutination of the red blood corpuscles of many other species has also been useful in differentiating certain of the viruses. The Melbourne workers[9 10] have recently described a possible relation between the viruses of vaccinia and infectious ectromelia of mice which gives rise to much interesting speculation. Red blood cells from only 50% of fowls are fully susceptible to agglutination by these viruses. With the exception of mouse red-blood cells, which are agglutinated specifically by ectromelia virus only, both viruses gave negative results with three ducks, one man, two calves, three rabbits, and two rats. Two of five pigeons gave susceptible cells. Thus the susceptibility of mouse cells to ectromelia virus was not paralleled by any power of vaccinia virus to agglutinate cells from the species most susceptible to its pathogenic activity. The haemagglutination with both viruses is of the same character, but the haemagglutinins of these viruses differ from the influenza viruses in several respects. The agglutination is best shown at 37° C., in contrast to the influenza viruses, which give more satisfactory readings at lower temperatures. The haemagglutinin of ectromelia is distinct from the virus particles, whereas influenza virus haemagglutinin is a function of the actual virus particle. Ectromelia virus haemagglutinin is susceptible to inhibition by specific immune serum and to almost equal titre by vaccinia immune serum. None of the normal human, rabbit, or calf sera at a dilution of 1 : 10 showed any inhibition of agglutination. This contrasts with the usual finding with influenza virus strains.

There was in addition active cross-immunity between ectromelia and vaccinia viruses in rabbits and mice. The two viruses have a number of other common features. Both are relatively robust forms which survive well in broth filtrates or glycerolated emulsions at ordinary refrigerator temperatures. The elementary particles of both are probably about the same size. In the chorio-allantoic membrane of the developing chick embryo the difference in lesions is striking, but Burnet considers they can be ascribed to differences in the vigour of multiplication of the two viruses in embryonic cells. It is unfortunate that little or no evidence is available as to the natural occurrence of ectromelia in wild mice or other rodents. Burnet concludes that in general there seem to be no physiochemical and biological differences between vaccinia and ectromelia viruses great enough to preclude the possibility of a common origin. The differences between the viruses are, however, extensive enough to make it certain that if they have a common origin the two lines have undergone a long evolution in dissimilar hosts. Further comparative study of the other mammalian pox viruses using the red cell agglutination technique may help to elucidate the evolutionary history of the group.

ACUTE NON-SPECIFIC GASTRO-ENTERITIS

Acute gastro-enteritis affects persons at all ages, but is rarely fatal except in the very young and the old. Some of the causes of this disease are known, such as the Salmonella and dysentery groups of organisms, food-poisoning due to bacterial exotoxins, and also food-poisoning caused by the toxic products of bacterial growth. There remains a large proportion of cases in which no specific cause can be found, and in which the clinical syndrome varies, this suggesting that there is more than one infective agent responsible. Included in this group is true neonatal diarrhoea of the type reported some months ago at Derby,[1] where no adults were affected but there was a high mortality among the babies. Maternity hospitals in Oxford and Leicester had another type of outbreak in which the nursing staff, mothers, and babies were affected, though on the whole the disease was less severe than at Derby. There were no signs of upper respiratory tract infection in these outbreaks, and the same applies to the two epidemics in Cornwall described by Hargreaves elsewhere in this issue (p. 720). In other outbreaks, particularly those affecting adults, there have been signs of faucial infection; this was true of the epidemics discussed by Bradley[2] and by Reimann.[3] There have also been large numbers of cases among the general public in widely separated parts of the country. Here the disease has had a very sudden onset, the first symptom being vomiting followed by diarrhoea, with a fairly rapid recovery, the illness lasting about three days.

It has been suggested that a virus is responsible for acute gastro-enteritis, a view supported by Reimann and discussed by Hargreaves. Work in this country on lines similar to Reimann's has consistently given negative results, but it is possible that the infective agent in the cases studied was different, as they did not show faucial involvement. Acute non-specific gastro-enteritis is often diagnosed as "gastric influenza," but it is unlikely that the accepted influenza viruses A and B play any part; so far as incidence is concerned the two diseases do not bear any relationship to one another. Gale[4] has drawn attention to certain strains

1 *Science*, 1941, **94**, 22.
2 *Canad. J. Publ. Hlth.*, 1941, **32**, 530.
3 Nagler, F. P. O., *Med. J. Austral.*, 1942, **1**, 281.
4 North, E. A., *Austral. J. exp. Biol. med. Sci.*, 1944, **22**, 105.
5 Burnet, F., *Nature*, 1945, **155**, 543.
6 Burnet, F., *Austral. J. exp. Biol. med. Sci.*, 1942, **20**, 81.
7 Lush, D., *J. comp. Path.*, 1943, **53**, 157.
8 Beveridge, W. I. B., and Lind, P. E., *Austral. J. exp. Biol. med. Sci.*, 1946, **24**, 127.
9 Burnet, F., and Boake, W. C., *J. Immunol.*, 1946, **53**, 1.
10 —— and Stone, J. D., *Austral. J. exp. Biol. med. Sci.*, 1946, **24**, 1.

1 *British Medical Journal*, 1947, **1**, 399.
2 Ibid., 1943, **1**, 309.
3 *J. Amer. med. Ass.*, 1945, **127**, 1.
4 *British Medical Journal*, 1944, **1**, 631.

of *Str. faecalis* which are active producers of tyramine, a substance possibly toxic to young babies; such strains have been isolated from a few outbreaks of infantile diarrhoea. Tyramine would be non-toxic to adults, however, because they are able to break it down.

There is increasing interest in the part played by the coliform group of organisms and their possible pathogenicity. Work by Kauffman[5] and by Vahlne[6] has laid down a classification of this group based on serological methods. Vahlne found a high incidence of two or three groups among coliform strains isolated from cases of cystitis, appendicitis, and cholecystitis, so certain coliform strains may perhaps be accepted as being more potentially pathogenic than others. Stuart[7] and Christensen[8] have suggested that these organisms are responsible for gastro-enteritis in adults but the evidence they give is not conclusive.

Though the aetiology of acute non-specific gastro-enteritis is unknown there are circumstances which favour its occurrence. The majority of cases of neonatal and infantile diarrhoea appear to arise in institutions, a fact to be accepted with reserve since there are no reliable figures on which to assess the incidence in the general population. Nevertheless, descriptions of recent outbreaks refer to overcrowding in maternity units and nursery schools and stress the inadequate nursing facilities. It is obvious that these conditions are ideal for the spread of any infective agent.

Kershaw, in another part of this issue (p. 717), ascribes some forms of acute gastro-enteritis to local chilling of the abdomen. This may be a factor in the cases which he describes, but it is unlikely to operate in Britain. Here chilling predisposes the patient to the most common of all infections in this country—that of the upper respiratory tract. The moral of Kershaw's article lies in its insistence on adverse hygienic and other conditions as being important factors in determining the appearance of a large number of cases of gastro-enteritis in a community in which the disease is sporadic. Though interest may be centred on the actual agent responsible for disease, it must be remembered that any condition which lowers the resistance of the individual will favour the onset of infectious disease, and where the agent is only potentially pathogenic, then external circumstances may in fact determine the onset of an epidemic in a community.

SWISS RATIONS

Prof. A. B. Fleisch was president of the Swiss *Commission fédérale pour l'alimentation de guerre*. His account[9] of food control is particularly interesting because the Swiss problems were very similar to ours. The Swiss had imported over half their food. In order to check the growth of a black market they aimed at supplying enough calories, and tried therefore to produce the maximum energy value from their soil. Prof. Fleisch discusses the calories and protein for human consumption obtained per acre from various crops and from livestock. The cultivated area was doubled, and potato crops rose to two and a half times their pre-war level. Livestock, not excluding milch cows, was reduced, though the numbers of pigs and hens were not cut down as drastically as in Britain. The extraction rate of flour was raised to 94% or over for a short period and was kept at about 90% for most of the war; so long as the rate was not over 90% the flour proved satisfactory.

The Swiss were not able to import butter or substitutes; their 2-oz. ration was made from milk produced at home. They were left with the problem of the best use of skim milk, previously used for feeding livestock, and few people chose the 2 pints which could be taken in place of 1 pint of whole milk. There was also little demand for dried skim milk. In spite of propaganda to stimulate the use of skim milk for human consumption 38% was still used for feeding livestock. Rationing was introduced gradually from November, 1939, onwards. The supply of milk was restricted from January, 1942; inequality of distribution caused much bitterness. Milk was rationed from October-November, 1942, at the same time as bread, which had been much used for feeding hens and other livestock. Extra rations were allowed for adolescents aged 12 to 19, for pregnant women, and for three categories of workers in amounts graduated according to the heaviness of their work. Children up to 6 years received special rations. A low-price ration card was introduced which allowed the purchase of more of the cheaper and less of the dearer foodstuffs without alteration of calories, protein, or fat. Canteen meals were considered as a means of saving fuel, but were held to be impracticable, since Swiss workers have a two-hour break in the middle of the day. After the rationing of bread and milk had begun, coupons had to be given up for school meals. In the winter of 1944–5 the children could no longer afford these coupons, and the number of meals supplied fell; during the summer of 1945 coupons were no longer demanded.

The number of calories taken by a normal consumer, with average consumption of unrationed foodstuffs, was in the neighbourhood of 2,100 per day, except during the middle half of 1945, when the lowest level reached was 1,783 calories in May. Prof. Fleisch compares this intake with the average calories taken per head according to *Food Consumption Levels in the U.S.A., Canada, and the United Kingdom*. This comparison is most misleading. This pamphlet, as is expressly stated, gives the calories per head calculated from the amount imported and produced and not, as has been incorrectly stated in a White Paper, "at the retail level." The comparable figure for the number of calories taken in Britain per head was not between 2,900 and 3,000 but about 2,300.

The death rate from tuberculosis remained about the 1938 level, but the number of notifications in 1945 was more than twice the total for 1939. Death rates from other diseases decreased. There was less sickness among school-children, and their average heights and weights were maintained. The Tuxford index fell during the period of extra scarcity in 1945 and then recovered. There was also much less dental caries. The Swiss Paediatric Association discussed rickets in June, 1943, and did not consider that it had become more frequent or severe. Opinion leaned towards the use of single large doses of vitamin D in prophylaxis: of the children in Zürich, 60% were so treated in the winter of 1942–3.

From the autumn of 1941 to the spring of 1946 the weights and haemoglobin levels of 700 persons were recorded. Both fell slightly in 1945 and then rose again. Apart from this there were seasonal variations, weights being highest in the winter and haemoglobin values in the summer. There was much agitation in the newspapers and in Parliament for vitamin supplements, but the great majority of doctors did not consider that adults needed them. In a short experiment at Zürich supplements of vitamins B_1 and C were given to school-children. They had no detectable effect on growth but were thought to improve appetite and to reduce fatigue.

[5] *Acta pathologica*, 1944, **21**, 20.
[6] *Acta path. microbiol. scand.*, 1945, Suppl. 62.
[7] *J. Bact.*, 1946, **52**, 431.
[8] Ibid., 1947, **53**, 317.
[9] *Ernährungsprobleme in Mangelzeiten.* By A. B. Fleisch. Basle: Schwabe and Co. 1947.

LEPROSY IN BRITAIN

Since the war a small number of cases of leprosy have been detected in Britain among returning soldiers and prisoners of war from the Far East. We are indebted to the medical secretary of the British Empire Leprosy Relief Association for the following brief notes of six cases already seen.

Case 1.—Male, aged 38, civilian internee, Far East. Diffuse, slightly raised, irregular, reddish-brown inflamed areas on face, trunk, arms, and legs. History of slow spread for the last two years. No lesions on genitalia, lower abdomen, or any flexor surface. Scrapings from the corium of the affected skin showed abundant acid-fast bacilli. Diagnostic points: Far East history under bad conditions; long duration of lesions; distribution; acid-fast bacilli.

Case 2.—Male, aged 34, Far East prisoner of war. Lesions on upper and outer left arm and right loin of eight months' duration—about 2 in (5 cm.) in diameter, roughly resembling ringworm. Edge slightly raised and dull red with well-defined margin. Area of skin enclosed by the ring is flattened and slightly hypopigmented. Definite anaesthesia to light touch. No acid-fast bacilli found.

Case 3.—Female, aged 49, civilian internee, Far East. Lesion just above and on outer side of left knee. Duration three years. Lesion oval-shaped, roughly resembling ringworm; long diameter about 2½ in. (6 cm.); margin pale yellowish-red and slightly raised. Both centre and margin of lesion show definite anaesthesia to light touch. No acid-fast bacilli found.

Case 4.—Soldier with service in Far East. Lesion on left loin for last eighteen months—about 4 in. (10 cm.) in long diameter; oval plaque slightly raised and about the colour of a subsiding erysipelas. Anaesthesia to light touch. No bacilli.

Case 5.—R.A.F. officer with service in several theatres. Lesion of two years' duration. Faint diffuse blush on upper right shoulder with no defined edge. No anaesthesia. Scraping from corium showed acid-fast bacilli.

Case 6.—Soldier with service Far East. Diffuse yellowish-brown infiltration of face and irregular ill-defined patches over body. Both ulnar nerves thickened above elbow and tender on palpation. Duration four years. Scrapings from the corium show masses of acid-fast bacilli.

Cases 2 and 3 are both early tuberculoid leprosy, the diagnosis being made from the clinical appearance and the anaesthesia. Bacilli were not found. Case 6 is a case of advanced leprosy, infective to children on prolonged contact, which unfortunately went on for four years before being diagnosed. Other cases undoubtedly exist and it may be expected that more will develop. The diagnosis of leprosy should be kept in mind in all cases of resistant skin lesions of long duration where there is a history of service and residence in countries in which leprosy is endemic. The importance of early diagnosis and treatment need not be emphasized.

LEPROSY IN THE EMPIRE

An exhibition arranged with the object of drawing public attention to the incidence of leprosy in the Empire is to be held at Overseas House, St. James's, from June 11 to 21. The British Empire Leprosy Relief Association is responsible for the exhibition, which will be opened by Lord Wavell, and will be named "Who Walk Alone," after the American best-seller by Perry Burgess. At a preliminary Press conference Sir Bernard Bourdillon, chairman of the Association, gave the number of lepers in the Empire to-day as two millions, of whom 97.5% were in India and Africa. A great deal had been done by means of self-supporting settlements, with well-planned houses and streets, each settler having his own farm land and some job to do within the settlement. The organization of settlements had greatly diminished the former concealment of the disease, which of course encouraged its spread, and it was shown that with good attention and care the leper's expectation of life might be almost normal. Help in the treatment of leprosy had been afforded by the sulphonamide drugs, but these were expensive as compared with the usual chaulmoogra oil treatment. The seeds of the chaulmoogra tree were grown in the settlements themselves, so that each injection cost only about sixpence.

Dr. G. A. Ryrie, medical secretary of the Association, and formerly of the Sungei Bulch Leper Colony, Malaya, said that he expected a temporary increase in the number of lepers in this country as a result of the return of the 14th Army and prisoners-of-war from Burma. Perhaps 30 cases might come to light during the next five years. There was little fear of further infection during this incubation period. The exhibition will illustrate the progress of the fight against leprosy, the magnitude of the problems yet to be solved, and the urgent need of funds to enable the activities of the British Empire Research Association to be more widely extended.

NATIONAL HEALTH SERVICE ACT

EXECUTIVE COUNCILS

The Minister of Health, on May 15, laid before Parliament Regulations relating to the executive councils to be set up under the National Health Service Act, 1946. This is another of the essential preliminary steps in the organization of the new Health Service. The Fifth Schedule appended to the Act states that an executive council shall consist of a chairman appointed by the Minister of Health and 24 other members: 8 appointed by the local health authority, 4 by the Minister, 7 by the local medical committee, 3 by the local dental committee, and 2 by the local pharmaceutical committee. The Act envisaged the setting up of executive councils in each county and county borough to organize locally the family practitioner services.

The new regulations came into force on May 15, and do not apply to the Isles of Scilly. The procedure to be adopted is as follows:

A local health authority, local medical committee, local pharmaceutical committee, or local dental committee shall forthwith give notice in writing to the Minister of the name and address of any person appointed by them to be an original member of a council and to the clerk of the council of the name and address of any other member appointed by them. The clerk of the council shall forthwith inform the Minister of the names and addresses of any members so notified to him.

The first chairman of the council shall hold office until March 31, 1949. Of the original members of the council, other than the chairman, one-third shall retire on March 31, 1949, one-third on March 31, 1950, and the remainder on March 31, 1951. The order of retirement of the original members shall be determined by drawing lots at a meeting of the council held as soon as conveniently may be after its constitution.

The term of office of members will be three years and members will be eligible for reappointment. Where a vacancy occurs by reason of the death, resignation, or disqualification of any member, the vacancy will be filled either by a nominee of the Minister or by a person appointed by one of the electing bodies so as to maintain the balance of representation laid down in the Fifth Schedule.

Procedure

Questions considered by the council will be determined by the majority of the votes of the members present. Minutes will be kept by the clerk, who is to be a person appointed by the council and approved by the Minister. The clerk and such other officers as may be necessary will be remunerated in accordance with scales approved by the Minister.

The council is to appoint a finance committee and other committees as necessary. Except in the case of the finance committee, these committees may include persons who are not members of the council. The council may make, vary, and revoke standing orders for the regulation of the proceedings and business of the council and of its committees. The council is to meet "not less often than once in every three months."

Supplementary Ophthalmic Services

It is laid down in Part III of these regulations that, except in the case of areas exempted by orders made under subsection 4 of Section 41 of the Act, the executive council shall appoint an ophthalmic services committee. This committee will exercise

on behalf of the council the duty of making arrangements for the testing of sight and for the supply of optical appliances. The ophthalmic committee will have 8 members appointed by the executive council from among the members of the council other than those appointed by the local medical committee; and one medical practitioner nominated by the council from those members appointed by the local medical committee. Three other medical practitioners "having the prescribed qualifications," 3 ophthalmic opticians, and one dispensing optician will be appointed by "such organizations as the Minister may recognize as composed of members of the professions concerned."

In this connexion and for the purposes of Part IV of the Act and the Seventh Schedule the expression "medical practitioners having the prescribed qualifications" means:

A medical practitioner who has:

"(*a*) Completed an academic or postgraduate course in ophthalmology approved by the committee hereinafter in this paragraph mentioned and received a diploma or certificate in respect of such course; or

(*b*) Held for a period of two years an appointment as an ophthalmic surgeon or assistant ophthalmic surgeon on the staff of an eye hospital or a hospital having a special eye department; or

(*c*) Held any appointment for a period of two years affording special opportunities for acquiring the necessary skill and experience of the kind required for the services to be rendered, and who shall, to the satisfaction of the Minister acting on the advice of a committee to be recognized by him for the purpose of approving such qualifications, have had adequate, including recent, experience."

The original members of the ophthalmic services committee, which is to appoint its own chairman, are to retire on March 31, 1949. Thereafter the term of office of members shall be one year. Members will be eligible for reappointment. These regulations also define the "prescribed qualifications" for ophthalmic opticians and dispensing opticians.

PATENT MEDICINES

Proposals for Control

The Pharmaceutical Society of Great Britain has asked the Minister of Health to bring the sale and advertising of proprietary medicines under statutory control. The Society has submitted to the Minister a 14,000-word report, based upon five years' investigation. Since 1914, when the Select Committee of the House of Commons published its *Report on Patent Medicines*, newspapers, advertisers, pharmacists, and the manufacturers of proprietary medicines themselves have done much to suppress abuses, but the conclusion is reached that the position to-day is little less objectionable than it was then.

"Throughout the pages of most newspapers and periodicals in general circulation," states the report, "sufferers from all manner of diseases and ailments are offered beans, tablets, wines, powders, salts, pills, ointments, tonics, hormones, glands, and vaccines that will bring them youth, health, charm, slimness, strong nerves, inner cleanliness, lively livers, freedom from pain, increased (or decreased) weight, iron for the blood, purer blood, vitamins, contentment, resolution, immunization, vitality, and so on. The advertisers' claims are frequently so fantastic that one would not be surprised to find them offering secure jobs and large salaries into the bargain." To remedy this state of affairs the Society puts forward a number of proposals:

(*a*) The duty of securing the maintenance of proper standards for proprietary medicines and their advertisements should be placed by statute upon the Minister of Health in England and the Secretary of State in Scotland.

(*b*) In carrying out these duties, they should be assisted by an advisory committee including pharmacists, medical practitioners, and representatives of the appropriate Government departments, and persons with a specialized knowledge of the subject.

(*c*) A registrar having pharmaceutical qualifications will be needed, together with:

(*d*) A register of medicines and manufacturers.

(*e*) The sale of unregistered medicines should be prohibited.

(*f*) Standards for medicines and for advertisements should be prescribed by regulations made on the advice of the Committee. These standards should include: (i) a requirement that the disclosure of composition must be in approved words and quantities; (ii) the prohibition of false, misleading, or exaggerated claims; and (iii) the prohibition of offers of diagnosis through the post.

(*g*) Similar provisions should be applied to surgical appliances and to "treatments."

(*h*) Complaints of non-compliance with the regulations would be heard by the Committee, which would advise the Minister whether or not the medicine or the manufacturer should remain on the register; any action by the Minister would be subject to appeal to the High Court.

(*i*) The services of the inspectors of the Pharmaceutical Society should be available for the necessary duties of enforcement.

Probable Increased Demand

The introduction of a comprehensive Health Service is not expected in itself to minimize in any way the demand for patent medicines. The Select Committee prophesied in 1914 that the sales of secret remedies would tend to decrease because of the operation of the National Health Insurance Act. In point of fact the volume of proprietary medicine sales doubled during the next ten years. The public are not expected to react any differently to the new Health Service, nor is their right to self-medication denied. It is contended, however, that protection is needed in the exercise of that right.

"Unless, therefore," the report concludes, "appropriate steps are taken to provide this protection, the era of a comprehensive Health Service may bring with it the golden age for commercialized charlatanism, which makes a butt of the orthodox practitioners on whom the service depends and a victim of the public, to the prejudice of the Service. It is therefore desirable, before the compelling pressure of these selling methods can be exerted still further, to direct attention to the following conclusions which, it is suggested, are to be drawn from the facts set out in this report:

1. "Proprietary medicines are advertised in terms of the grossest exaggeration, advancing claims which are frequently fraudulent.

2. "The persistent and ubiquitous advertising of proprietary medicines makes the public conscious of disease, teaches that ill-health is the normal condition of human beings, and encourages self-medication as a habit.

3. "The claims made for some medicines lead to the public's postponing seeking skilled advice and encourage symptomatic treatment, thereby prejudicing the success of treatment directed to the cause of the symptoms.

4. "Many advertisements for proprietary medicines are based upon creating an atmosphere of fear—fear of ill-health or of an operation, of premature old age, of an incurable disease.

5. "Reliance is placed upon uncritical testimonials as evidence of the value of proprietary medicines.

6. "Exaggerated claims are made for medicines for the relief of chronic conditions, such as asthma and rheumatism, and hopes are held out which cannot be realized.

7. "By implication or indirectly the advertising of proprietary medicines undermines public confidence in a State Medical Service and in the registered medical practitioners at whose hands such a service must be provided.

8. "Questionaries are sent to patients with the suggestion that the manufacturers of the medicine will diagnose from the patient's answer what his complaint is and what medicine should be given him. These forms are sometimes never looked at and there is evidence that the same medicine is supplied without regard to the information which the patient gives.

9. "Pamphlets and advertisements are published which advertise articles as sexual tonics.

10. "Excessive prices and fees are charged for some medicines and for some treatments and money that can ill be spared is extracted from the sick.

11. "Many advertisements are couched in scientific or semi-scientific terms, often meaningless or having a pretence to scientific advance, designed to impress or deceive uneducated and credulous people.

12. "Endeavours are made to circumvent legal requirements relating to disclosure of composition.

13. "Certificates of analytical bodies referring to qualitative and quantitative particulars are issued to proprietary medicine manufacturers on a commercial basis and are used by them in advertisement in implied support of claims concerning which the certificates have no relevance.

14. "Preparations are compounded in a manner and of such substances as to defy analysis and preclude the production of evidence at law as to composition.

15. "The advertising of proprietary medicines is so extensive that the influence of advertisers prevents the ventilation of reforms in the public Press and so derogates from the principle of the freedom of the Press.

16. "The volume of advertising of proprietary medicines gives these articles a significance which is out of all proportion to their true value to the community."

According to the *Daily Telegraph* the Proprietary Association of Great Britain stated on May 16: "It is not easy in the absence of the report to comment in detail upon the findings of the Society. The censorship work of the Proprietary Association of Great Britain, the Newspaper Proprietors' Association, the Newspaper Society, and other trade organizations has practically eliminated all undesirable forms of advertising."

PROPOSED LONDON CENTRAL HEALTH COMMITTEE

Under the National Health Service Act the London County Council becomes the local health authority for the county of London and has the duty of establishing a health committee. An administrative scheme has been submitted to the Council for dealing with the local and domiciliary health services for which the Council will be responsible after April 1, 1948. Some of these services are already administered by the Council, others will be transferred from the city corporation and the borough councils, while yet others are duties newly imposed by the Act. The scheme proposed represents a new departure in local government in London, providing as it does for members of the city corporation and the borough councils to participate directly in the administration by the county council of the personal health services. The central health committee will consist of 46 members, of whom 30 will be members of the county council. One will represent the city corporation, and 9 the borough councils; the remaining 6 will be co-opted, after consultations with the regional hospital board and other appropriate bodies, in such a manner as to establish liaison with the hospitals and to secure the services of doctors and other experts. Of the 40 local authority members whose names are proposed, 21 are women.

The terms of reference of this committee include the provision, equipment, and maintenance of health centres; the care of expectant and nursing mothers and young children; midwifery; the provision of health visitors; home nursing; vaccination and immunization; ambulance provision; and liaison with hospital and general practitioner services. This committte will also be responsible for all matters relating to the function of the L.C.C. as local health authority under the Lunacy and Mental Treatment and Mental Deficiency Acts, and all matters at present the function of the county council concerning milk, food and drugs, registration of nursing homes and, at the request of the Education Committee, the medical treatment of school-children.

Medical Treatment of School-children

The report presented to the Council proposes that the new Health Committee should be responsible for providing, or making contractual arrangements for, the treatment (as distinct from the medical inspection) of school-children, in accordance with section 48 (3) of the Education Act. This proposal, it states, will permit the progressive integration of the treatment side of the school medical services with those other services, especially maternity and child welfare, which it will fall to the Council to provide under the new National Health Service Act.

Debate has taken place as to whether the sanitary functions of the public health service, including drainage and smoke abatement, should be transferred to the Health Committee, but it is felt they should remain where they are at present, combined with housing, and that the only concern of the new Health Committee, at any rate for some years, should be health matters affecting the person.

Area Health Subcommittees

The Council had already decided that the administration of the local health services should be decentralized, and that so far as practicable their day-to-day management should be entrusted to area committees. For this purpose it is proposed to split up the county of London into nine divisions, each division comprising from two to five metropolitan boroughs. The City of London is included with Bethnal Green, Poplar, and Stepney in one such division. Each of the divisions will have its health committee, really a subcommittee of the large central committee, and on each of these committees there will be members both of the county council and of the borough councils, the latter in about double the number of the former. Thus the largest of the divisions, comprising Hampstead, Paddington, St. Marylebone, St. Pancras, and Westminster, will have 23 local authority members, 15 of them drawn from the borough councils. The smallest division is the one covering Hackney, Shoreditch, and Stoke Newington, with 8 borough council and 4 county council members. There will be on each committee up to six additional co-opted members. These divisional committees, however, are not likely to be set up until on or after the appointed day.

It is claimed for the scheme that it will bring into the administration of the personal health services, in addition to the members of the county council, more than 100 members of the City corporation and the borough councils, 10 of them on the central committee and 92 on the divisional committees. It will also bring in 60 members—6 on the central and 54 on the divisional committees—co-opted for their special knowledge and experience of health and hospital matters.

R.A.M.C. WAR MEMORIAL FUND

The Royal Army Medical Corps—which next year celebrates its jubilee as a united corps under that name, and also its first appearance in the field, in the Khartoum expedition of 1898—is making a public appeal for a fund to commemorate the achievements of the Corps during the war. At a Press reception held at the Royal Army Medical College, Millbank, Sir Alexander Hood, Director-General A.M.S., described the aims in view. The fund is to be devoted to the welfare of families of all ranks of the Corps who fell in the war, also of all ranks who served and whose families may be in need through sickness or other misfortune. The term "welfare" includes monetary grants, assistance in training for civil technical qualifications, help with the education of children, and other purposes. A relatively small amount is to be set aside to provide a permanent memorial incorporating the names of the fallen. Sir Alexander Hood explained that it was considered desirable that no large amount should be spent on an expensive memorial in wood or stone; further, any central memorial, such as the equipment of a hospital or the making of a memorial garden, would necessarily be accessible only to a small section of those interested. It is not proposed to capitalize any large sum and use the interest only, but to distribute the money in such amounts as to afford substantial help in individual cases, and it is expected that the fund may cease within six or ten years. After the last war a similar fund amounted to £20.000, and it is hoped to beat that record. The personnel of the Corps, with the help of the Emergency Medical Service, have already raised £9,000.

An appeal for such a body as the R.A.M.C. is necessarily more difficult than for a territorial regiment which can draw upon its county or city associations. Moreover, as the work of the R.A.M.C. is not combatant but humanitarian, and has brought succour to every branch of the Army, as well as to many sailors and airmen—during the recent war well over four million sick were treated by the Corps—it is considered justifiable to bring the fund to the attention of the wider public. Sir Alexander Hood is president of the fund, and the list of vice-presidents includes several former D.G.A.M.S.s and other senior officers. Each of the Commands is represented on the committee, which also includes N.C.O.s and men. The honorary treasurer is Mr. C. G. Randolph, director of Messrs. Glyn, Mills and Co., of Kirkland House, Whitehall. The fund, of which H.M. the Queen is patron, has received special permission from Field-Marshal Lord Montgomery to include in the appeal his message to the Corps " . . . admiration and high regard to a Corps whose contribution to victory has been beyond all calculation."

Reports of Societies

PENICILLIN IN NEUROLOGY
ANGLO-FRENCH MEETING

A joint meeting of the Section of Neurology of the Royal Society of Medicine and the Société de Névrologie de Paris was held on April 15 in London, Dr. DOUGLAS MCALPINE presiding.

Sir HUGH CAIRNS said that four years ago Sir Howard Florey presented his department at Oxford with some penicillin. The first preparations contained only 50 to 100 units per mg. and were very impure compared with the crystalline preparation of penicillin II now available, which contained 1,650 units per mg., but the dosage of penicillin given intrathecally worked out then had survived the coming of more abundant supplies. In gunshot wounds of the brain it was no use placing penicillin in the brain wound and hoping that all infection would be quelled; all indriven matter and necrotic brain tissue must be removed. In the absence of blockage of the pathways penicillin given intrathecally spread to all parts. A single intrathecal injection of 12,000 units would usually maintain an adequate concentration in the cerebrospinal fluid for twenty-four hours, providing levels of between 0.3 and 0.6 unit per ml. Occasionally the penicillin disappeared more rapidly, so that when it was essential to maintain the concentration of penicillin in the cerebrospinal fluid it was better to give intrathecal injections twelve-hourly. The importance of a moderate intrathecal dosage was emphasized; he had never exceeded 20,000 units in a single dose. In most cases the lumbar route sufficed, but if the cerebrospinal pathways were blocked this route became ineffective. The cisternal route might be difficult in a case of meningitis, and there should be no hesitation in using the ventricular route whenever a block was suspected.

Systemic Administration

Penicillin given systematically, Sir Hugh Cairns continued, did not pass into the cerebrospinal fluid in appreciable amounts. Patients had developed relapses and had had pneumococcal meningitis when on systemic penicillin. However, it helped to overcome the primary source of infection and to deal with septicaemia when that was present, either from the primary focus or from relapsing meningitis. Penicillin also passed freely from the blood stream into the subdural space (though this statement should be made with some reserve because so far its proof rested on only one case). The sulphonamides were particularly important at the stage when the intrathecal administration of penicillin was being stopped. The immediate treatment of bacteriologically unidentified meningitis should be by sulphonamides and systemic penicillin in full doses; arrangements should be made for continuing such treatment during the transit of the patient to hospital, though there would be fulminating cases where that recommendation would not hold. In brain abscess most of the causal bacteria were sensitive to penicillin. Cerebellar abscess had presented a difficult problem, but with the aid of penicillin—and, where there was a Gram-negative organism, of streptomycin—success had been obtained, though this in no way diminished the need for unremitting expert care in each individual case. For preventing the infection of operation wounds penicillin powder was used as a routine; there was evidence that it was effective in diminishing post-operative infections.

In conclusion Sir Hugh Cairns said that penicillin was not miraculous in its effects. Given access to sensitive organisms it would assist in their destruction for so long as its concentration remained adequate. The use of penicillin demanded a greater degree of precision and systematic planning than had hitherto been accorded to less powerful remedies.

Penicillin in Meningitis

Dr. HONOR SMITH said that in pneumococcal cases penicillin was given intrathecally once or twice daily for a minimum of five days in doses of 8,000 to 16,000 units, made up in a solution with 2,000 units per ml. Larger doses, especially when given in concentrated solution, were no more effective and might be harmful. Lumbar, cisternal, and ventricular routes had been used for injection, and occasionally, in difficult relapsing cases, all three had been found necessary, but in uncomplicated cases the lumbar route was safe and effective. Of the sulphonamide supplements sulphadiazine was the drug of choice. The sulphonamides might be given as soon as meningitis was diagnosed to tide the patient over the interval which might elapse before treatment with intrathecal penicillin could be given. The complications most frequently seen were spinal block and relapse. Treatment of the relapse did not differ from that of the initial attack, and if the relapse was promptly recognized and energetically treated the prognosis was good. Fifty unselected cases of pneumococcal meningitis had been treated, with 39 recoveries. Of the remaining 11 patients, two died from causes other than the meningitis, and four were virtually moribund when admitted to hospital. In the treatment of meningococcal meningitis intrathecal penicillin was rarely required, excellent results being obtained by treatment with sulphonamides alone.

Penicillin in Neurosyphilis

Dr. C. C. WORSTER-DROUGHT said that immediate results in early syphilis had been shown to equal if not to exceed those obtained with intensive arsenical and bismuth therapy, and there was little or no risk of toxic reactions. In cases of early syphilis treated with penicillin alone a moderately high relapse rate soon became apparent. Much remained to be learned in working out the most satisfactory method of applying penicillin in these conditions. Intravenous penicillin had little to commend it. The continuous drip technique was clumsy and there was a risk of thrombophlebitis. Relapse seemed to be more frequent after intravenous than after intramuscular injection. Recently there had been a tendency in the United States towards larger doses, several authors advocating 40,000 units every three hours up to a total dosage of 4 million units. Others thought that equally good therapeutic results were obtained by giving much larger doses of penicillin at longer intervals. If it was eventually shown that a fairly constant level of penicillin in the blood was really necessary for full therapeutic effect the use of the oil–wax preparations might have to be considered. Oily preparations occasionally failed to be absorbed and there was a localized tender induration three days after injection. He had not abandoned arsenicals and bismuth used in conjunction with penicillin; it was even possible that synergistic action existed between the two methods of treatment.

Whether or not penicillin passed the blood-brain barrier, it was certainly capable of exerting considerable effect on the meninges and central nervous system when given by parenteral injection. In his earlier cases treated with penicillin he did in fact use the intrathecal route, but he had abandoned routine intrathecal injection in neurosyphilis, preferring intramuscular injection in adequate dosage, except in certain cases of tabes with severe and frequent lightning pains. Serological reactions, particularly the Wassermann reaction, were often little affected by penicillin treatment, and would continue to show positive results long after the cerebrospinal fluid had become normal. This appeared to be an additional argument for following up the penicillin with bismuth therapy. His present method of treating tabes was to give an initial course of penicillin intramuscularly up to a total dosage of 4 or 5 million units. This was followed by the usual arsenical and bismuth therapy until the serological reactions became negative.

Penicillin in General Paresis

Dr. W. D. NICOL mentioned 57 cases admitted to the Malarial Therapy Centre at Horton, 42 of them cases of general paralysis of the insane, and the remainder tabes and tabo-paresis and miscellaneous cases. Thirty of these cases were given a course of penicillin after malaria; 14 received penicillin only, and 7 received a subsequent course of malaria. The penicillin was administered intramuscularly in every case in a dosage of 300,000 units daily, in one injection, for fourteen days. One of the most striking clinical features was the physical and mental improvement in many patients—a phenomenon rarely if ever seen during malarial therapy. Most dramatic results were seen in patients who were confused and in poor physical condition. Penicillin would prove a useful adjunct to malaria, but only time would show whether it could supersede it. It was known that malaria in an established case of general

paralysis of the insane should be accompanied by some additional form of therapy, and it might be that penicillin would be the optimum choice.

Cerebral Oedema

The French visitors opened a later discussion on cerebral oedema. Prof. ALAJOUANINE spoke on cerebral oedema in arterial hypertension.

The acute and temporary form, he said, was not the more frequent, but it had the more distinctive features. The clinical picture resembled closely that of subarachnoid haemorrhage. The patient first suffered from an intense headache, then vomiting occurred, with failure of visual function, and, sometimes gradually and at other times suddenly, there was unconsciousness, developing into deep coma. Several of his patients had had a number of attacks of cerebral oedema; one had had ten attacks in two years. In some cases there was also subarachnoid haemorrhage, so that there could be a mixture of the two conditions.

The second type, the chronic or permanent form of cerebral oedema, presented a different picture. Sometimes, but not always, it developed after two or three of the acute attacks, showing that there was a relationship between the two. The symptoms were those of pressure, which was demonstrated by headaches, vomiting, and progressive drowsiness. This form of cerebral oedema had a bad prognosis. Sometimes hypertension and sometimes cerebral haemorrhage was the cause of death.

Dr. DOUGLAS MCALPINE said that the subject of cerebral oedema had been rather neglected in this country by neurologists because the cases were usually admitted to hospital under a general physician. In a recent series of 18 cases the average age was 58. It was difficult to fit in the clinical picture with the conception of generalized cerebral oedema, but, as Prof. Alajouanine had suggested, there were various grades and degrees.

Dr. JACQUES LE BEAU (for M. CLOVIS VINCENT) discussed cerebral oedema in neurosurgery. He said that, excluding head injuries, it was believed that compression of the brain stem might have something to do with the production of cerebral oedema, though it was not believed to be the cause. Prof. GEOFFREY JEFFERSON, Dr. J. G. GREENFIELD, and Dr. A. M. STEWART-WALLACE contributed to the subsequent discussion.

ELECTRONIC HEARING-AIDS

At a meeting of the Section of Otology of the Royal Society of Medicine on May 2, with Mr. H. V. FORSTER in the chair, the design and application of electronic hearing-aids was the subject of a paper by Mr. E. C. NAYLOR-STRONG, who demonstrated the components of these instruments and discussed their advantages and disadvantages.

Mr. Naylor-Strong said that if certain minerals or salts such as quartz were submitted to mechanical strain of a very slight order an electric current of minute proportions was produced between the faces of the crystal. A crystal of quartz or Rochelle salt was attached to a paper diaphragm or the like. A sound wave falling on it would move the diaphragm slightly and so bend the crystal, producing electric currents so small as to be unable to activate any mechanism to produce sound unless magnified many thousands of times; hence the need for the valve amplifier. The amplifier must be capable of reproducing and magnifying faithfully each electric current in rapid succession and over all the necessary frequencies. It consisted of thermionic valves, each connected to its neighbour by a set of electrical components.

Use of Audiograms

Hitherto the audiogram had been used as a measure of the patient's hearing loss and, to some extent, as an aid to diagnosis. It could also demonstrate the loss of certain pitches of sound, so that if it was desired to raise all the frequencies to the same level it could be shown that it was necessary to amplify some and leave others as they were or amplify them to a different degree. A hearing-aid which would enable the patient to hear all sounds equally was, so to speak, an amplifier which "distorted" what it heard in a predetermined manner, the "distortion" being the complement or reverse of the distorted sound heard by the deaf person.

The problem was, by studying the graph of the patient's hearing, to arrive at a judgment as to whether a particular aid would be of use to him. The complaints made by many patients had their origin in causes the effects of which the patients were unable accurately to describe. After analysing many complaints he had found that the telephonic or metallic effect of the hearing-aid on a patient's hearing was due either to amplification at the wrong frequency or to over-amplification in some part of the range. It was possible to make a suitable adjustment in many cases. The matter was not one purely of loudness of sound, but rather of the part of the sound which should be amplified in order to transmit it naturally to the wearer of the aid. It was comparatively easy to fit a practicable hearing-aid in middle-ear defects, whatever their cause, and also in cases in which there had been a radical mastoid operation or any other surgical treatment which had removed or bound down the small bones.

What type of earpiece should be fitted in a case of otosclerosis? Here bone conduction was good and preponderated over air conduction, so that it might be supposed that it was better to use a bone conductor than an air conductor, but he gave reasons why this was not so. Bone conductors did not reproduce the high notes to the same extent as did air conductors. Some patients could hear equally well with bone or air conductors; in such cases the bone-conducting fitment was less necessary.

The results of experiments he had carried out showed that the frequencies which should be relied on in order to get intelligent speech were 512 to 2,096, or perhaps 3,500. The loss which could be allowed while at the same time reasonable hearing remained was about 30 db. on the average; if the frequencies could be raised between the stated limits to a loss of only 20 db. the patient would probably hear with an aid. Taking 30 or 40 db. as an arbitrary line, the lower the frequency at which hearing loss took place, the more difficult it was for an aid to be fitted. In most people over forty years of age there was a loss of high tones—the commencement of nerve deafness. The greater the loss of high tones and the earlier on the frequency scale it occurred, the more difficult it was to use the electronic type of aid, and ultimately there came a time when no hearing-aid could be fitted. The difficulties in such cases were those of overall amplification; as the gain from the hearing-aid increased so did the internal noise level, and these patients were most susceptible to the heterogeneous frequencies of background noise produced in the instrument by thermal agitation in the valves or by other electronic causes. This was a matter upon which research was still proceeding. Another difficulty arose from the frequency response of electric aids. Their size and limits made it virtually impossible for their cut-off to be sharp. Although the responses might be varied, some unwanted tones always came in because of the heterodyne effect of sound of varying frequency.

Mr. Naylor-Strong then showed a series of audiograms depicting successful cases and also failures. All the results shown were from tests he had himself conducted with the audiometers and measuring instruments made in his own laboratory. In conclusion he ventured the opinion that when the Government issued to the public hearing-aids of electronic design there would be little that was revolutionary. It seemed highly probable that the designers would confine themselves to well-tried principles and produce aids similar to those exhibited to the Section.

In the course of a brief discussion Mr. EWART MARTIN expressed concern for the elderly deaf patient with lower-tone loss insufficient to preclude background noise, so that hearing would be improved by increase of the upper tones, though with a loss of 50 db. at 4,096 and almost complete loss at 7,000. If fatigue resulted in permanent deafness the provision of an aid would cut out that person's hearing, whereas if not supplied with an aid, he might be able to hear by means of an ear trumpet. Mr. NAYLOR-STRONG agreed that there was need for more research concerning the tiring or fatigue resulting from hearing-aids. But he wondered whether any patients had been heard to say that they heard worse after having been fitted. If the aid was properly adjusted he could not agree that it would make the hearing worse.

Correspondence

De Morgan's Spots

SIR,—Capt. A. R. Murison and his fellow investigators on the above subject (May 10, p. 634) remark that the literature on these "ruby spots is extremely meagre." May I suggest that the reason is that most of those who have taken any interest in the subject and have looked for these spots in various morbid conditions have come to the conclusion, as I have, that almost every adult person, regardless of the state of his health, has one or (mostly) more of the spots on his body. I feel sure that Sampson Handley and all other surgeons attach no importance to their presence in regard to the diagnosis of cancer. Doctors who examine patients with degenerative cardiovascular conditions have doubtless found them constantly present, and so with psychiatric and other specialists. Personally I have found one or more present in every adult and even some children in whom I have taken the trouble to look for them. An adult without any must indeed be a *rara avis*.

For a more exhaustive statistical study of the subject I would propose that in every adult case the whole of the body (not merely the greater portion) should be examined. If patients and others were assured that there was absolutely nothing to fear from their presence, they could be left to examine most of their own skin, and in this way a *fairly reliable* statistic, with relatively little trouble, could be reached. I wish some archaeologically minded doctor, in his spare time, would take the trouble to search the old treatises on the detection of witches in order to ascertain what the professional "witch-finders" thought of the presence of ruby spots.—I am, etc.,

London, W.1. F. PARKES WEBER.

Physical Health of Children attending Day Nurseries

SIR,—I was interested to read Dr. Margaret E. McLaughlin's account (May 3, p. 591, and May 10, p. 631) of the physical health of children attending day nurseries, especially with reference to the measles epidemics. During the months of February, March, and April of this year there was an outbreak of measles in my district. Most of these cases originated at the day nursery; in all I had seventy cases. At the beginning of the outbreak the children were attending the nursery up to the appearance of the rash, and only during the latter end of the outbreak were they sent home when the cough and rhinitis were present.

I should like to make a few comments on the complications of measles. I had three cases of bronchopneumonia, occurring at the latter end of the first week and beginning of the second week after the rash appeared, which responded favourably to sulphathiazole. I also had about half a dozen cases of otitis media, occurring in the second and third weeks, three of which had to have a paracentesis tympani done. The rest resolved at the early stage with sulphathiazole. Finally I had six cases of conjunctivitis, occurring in the first week. These were the result of treatment by the mothers, who washed the eyes with various solutions from milk to boracic lotion. It is interesting to note that in this district washing the eyes out with milk is a common and accepted practice.—I am, etc.,

Sheffield. I. GOTTLIEB.

SIR,—The difficulty about articles such as those by Dr. Margaret E. McLaughlin in the *Journal* of May 3 (p. 591) and May 10 (p. 631) is that others are liable to draw more definite conclusions from them than do the authors, who are aware of at least some of their limitations. You state in your leading article on the subject that her results are "clear-cut and striking." They are certainly striking, but it is not so clear whether they are clear-cut. One of the most striking things about them is that the only accurately measurable criterion which she used in her comparison of a group of nursery children with a group living at home—namely, the weight—gave results favouring the nursery group. The remainder of her material was based entirely on subjective impressions, which are so often misleading. It would appear also that she did not even have the advantage in making the comparison of not knowing to which group a child belonged. It is now generally recognized that for any scientific purpose in work of this kind it is essential that the examiner should not know to which group an individual belongs, otherwise the result may merely reveal an unconscious bias.

It is clear from what Dr. McLaughlin herself says that her two groups are derived from different classes of the community, doubtless with different income levels. In addition, so far as one can judge from her article, she does not allow for the fact that infectious diseases, which she found more frequently in the nursery group, are more readily diagnosed by trained nursery staff than by parents. It is a matter of general agreement that such remarks as "general condition good, satisfactory, etc.," are of very little value for scientific purposes, since different observers differ widely in their impressions, and even the same observer will report very differently on the same group examined after an interval. This criticism applies to all the criteria of health, except weight, used in this investigation.

Desirable though it may be, therefore, accurately to assess the effect on health of the nursery environment, and important though it is to minimize infection in our new nurseries, the present investigation does not afford the opportunity for such accurate assessment and must not be used as the basis for an illogical campaign against nursery provision.—I am, etc.,

Orpington, Kent. BRIAN H. KIRMAN.

Acid Drinks and Sulphonamide Therapy

SIR,—Dr. Petronella Potter (May 10, p. 654) raises an important opinion in regard to the administration of "acid drinks" during sulphonamide therapy which if accepted is bound to cause a great deal of unnecessary harm and will actually incur the very danger of renal complications which she is so keen to obviate. Apparently it is still not realized that the organic acids used in these drinks—e.g., tartaric and citric—are those which are metabolized in the body into carbon dioxide and water, and that any basic element present in the fluid—e.g., sodium or potassium—is freed to form an alkaline solution. For example, imperial drink contains 0.08% free citric acid and 0.46% potassium tartrate, and I think it is possible to cause an alkalaemia on sufficiency of this drink alone.

I would like briefly to recapitulate the value of giving these acid drinks: (1) By their flavouring value they greatly help the patient to assimilate large quantities of water. (2) The acid flavour stimulates salivation and therefore helps to keep the mouth clean—a very important consideration in febrile patients. (3) They aid alkalization. (4) They have caloric value because of the contained sugar. Therefore the statement that "all fruit drinks" (and presumably acid fruits) must be forbidden has been mistakenly applied, and it should be known that these drinks are still valuable as an aid in the nursing and treatment of febrile patients.—I am, etc.,

Netley. LEON RADCLYFFE.

SIR,—Dr. Petronella Potter's letter (May 10, p. 654) condemning the administration of fruit drinks to supply the extra fluid required in sulphonamide therapy fails to take into account the fact that the natural fruit acids undergo oxidation in the human body and their acidity is destroyed. To quote from Dr. V. L. S. Charley's recent article in *Chemistry and Industry*, 1947, **19**, 221, on "The Nutritive Value of Fresh Fruits and Fruit Juices": "The acids in fruits are very largely composed of citric, tartaric, and malic acid. These are metabolizable and are used in the body as a source of energy. The ash constituents are largely composed of basic materials, and consequently their ultimate effect is to make a contribution to the alkaline reserves of the blood and urine."

The use of such drinks should not therefore be condemned on the evidence submitted.—I am, etc.,

Widnes, Lancs. R. A. GREGORY.

Groundnuts in East Africa

SIR,—The *Journal* of March 8 has just arrived, and I must comment on the leading article entitled "Groundnuts in East Africa" (p. 301). No credit was given to the United Africa Company, Limited, who submitted the original plans to the Secretary of State for the Colonies and Minister of Food substantially the same as have been adopted, and, according to the official Tanganyika Territory Government pamphlet, *The Groundnut Scheme*, the proposals "had been worked out in

some detail." The proposals as submitted were "considered of sufficient importance and promise to require a thorough investigation on the spot," and this led to the immediate dispatch of an official mission. This puts in their right aspect your words, "this long-sighted scheme of the present Government," who, though showing most commendable speed in putting the scheme into immediate effect to catch the 1947 planting season, were not the originators.—I am, etc.,

Shiwa Ngandu, N. Rhodesia. C. M. PHILLIPS.

Medical Certification

SIR,—I gave a certificate on behalf of a patient, whom I have attended for years for a chronic condition, to enable her to make a request for extra money to go to Aix-les-Bains for special treatment, which she was accustomed to have before the war with considerable benefit. This certificate was sent to her bank, who replied that their foreign department had discussed the matter informally with the Bank of England, who stated "that the certificate supplied is not sufficiently informative and must cover the following points: (1) Age of applicant. (2) Nature of complaint from which the applicant is suffering. (3) What treatment has been given and with what result. (4) Why it is considered necessary for applicant to leave the United Kingdom for further treatment. (5) Why Aix-les-Bains has been selected. (6) Duration of stay recommended."

I ask you to publish these bare facts as I should like to hear the opinions of my medical colleagues. It would appear that a medical principle of some importance is involved in such a demand, which the Association might consider and take action with the department responsible. As far as the patient is concerned, she is naturally indignant that her age and details of her general health should be in this way made known to the bank officials.—I am, etc.,

London, W.1. MORTON SMART.

SIR,—With State medicine almost upon us, and with it presumably an enormous increase in form filling, is it not time for representation to be made for the simplification of forms?

In the case of infectious diseases surely it would be sufficient merely to state the number of fresh cases which have occurred each day. I cannot believe that the person's age, sex, or exact address are of any practical importance in diseases such as measles and whooping-cough when the public health authorities do not have to be called in.

I suggest that a printed form as follows is all that is necessary: "I have this day diagnosed . . . fresh cases of measles . . . whooping-cough . . . Signature: address."—I am, etc.,

Newport Pagnell, Bucks. A. A. CLAY.

Basic Salary

SIR,—Those of us who have now a well-established practice can no doubt view with equanimity the prospect of a salary based on capitation fees. As one who has in the past fallen into most of the traps which beset the unwary (or the trusting) in general practice, I think this attitude is just the acme of selfishness. Have these protagonists of a capitation fee only ever tried to start a practice from scratch and found what a soul-destroying business it can be?—unless of course they happen to have been made in the image of Midas.

These generous souls (made in the same mould no doubt as Dr. J. A. Jamieson (March 29, p. 425)) are the ones who talk so loftily at B.M.A. meetings about their principles. Let them be compelled to scrape together a living from this kind of practice and they will then perhaps learn the burning truth of Mr. Micawber's elementary economics.—I am, etc.,

Hove, Sussex. G. L. DAVIES.

Infant Deaths

SIR,—The article by Dr. J. Tudor Lewis (Dec. 14, 1946, p. 893) and subsequent correspondence (Dec. 28, p. 1006, and Jan. 18, p. 114) draw attention once more to the all-important subject of infant deaths. I have just picked up 3½ months' issues of the *B.M.J.* and I write at sea, some thousands of miles from home, so it is likely that other letters will have appeared long before mine reaches England; I would, however, like to make some observations.

Dr. Lewis's first point is the question of liaison between hospital and home. In my opinion the "family doctor," if such a person is to exist in the future, is the ideal and possibly the only satisfactory liaison officer. If he does not actually deliver the woman in the maternity home or hospital, he should whenever possible take an active part in supervising and advising her on her own health and the care of her baby before she is sent, or has permission to go, home. He is the one person in a position to judge her ability and to assess her domestic difficulties. Dr. Lewis's article appears to be written entirely from a "public health" or "State medical" point of view—private practice and choice of doctor have ceased to exist.

I agree entirely with the comments of Drs. I. M. Harkness and J. B. Cochrane (Jan. 18, p. 114) on the discharge of the five cases noted. What terribly tragic and pathetic reading is provided by the record of Dr. Lewis's seven cases! All in my opinion were discharged from hospital far too soon. Even to good homes with more than average facilities it is asking too much for an enfeebled anaemic woman to undertake household duties and the care of an undersized puny infant 10 days after confinement. The two children in Case 1 after one "triplet" had died, and weighing only 4 lb. 2 oz. (1.87 kg.) at birth, were kept in hospital only four weeks and two days. The remaining cases were discharged to unsatisfactory conditions after only 10, 15, 10, 10, 9, and 9 days in hospital, respectively—totally inadequate periods either to stabilize the babies or to let the mothers recuperate. And what exactly is meant by "poor mothering"? Poor mothercraft can scarcely be blamed for the enlarged congenital heart in Case 2. Dr. Lewis's fourth clause under "Conditions Affecting the Mother" is "Maternal inefficiency; poor mothercraft and homecraft; lack of parental responsibility." How much of this so-called "poor mothercraft," I wonder, is due to alienation or frustration of "mother instinct" by the inefficient teaching of modern "scientific" rule-of-clock methods?

I have not the least idea of how babies are wrapped or nursed in any of the hospitals under Dr. Lewis's eye, but I would like to refer to my two letters concerning infant deaths in your issues of April 14 and June 2, 1945 (pp. 529, 784). Is it possible that when a baby is leaving an institution the parting instruction to "keep him warm and on no account allow him to catch cold" may be the sentence of death to be executed by the relatively strong hands of the anaemic, anxious, and worrying mother? Lacking in "mothercraft" perhaps, but doing her best to carry out instructions and possibly trussing up her infant with its arms secured against the body, thorax compressed, and the feeble spark of life all but extinguished.

I have seen no correspondence confirming the suggestion expressed in my two letters. No doubt the point made is too obvious. It is still argued that wrapping babies with their hands in their groins does not restrict their breathing. It only needs to be tried without even fastening the shawl. With arms in that position it is impossible to fully inflate the lungs; then atelectasis, pulmonary congestion, bronchitis, bronchopneumonia, and the onset of every other respiratory infection are favoured. I also think that digestive troubles, difficulties with feeding, and marasmus are further complications of this method of wrapping. All are conditions from which young babies so frequently die. I am told that babies are swaddled in the manner about which I have written at one of our great teaching hospitals. Can it be that these experts leave some freedom of movement and do not over-tighten the wrap, but that the pupils who have seen no ill-effects follow have not grasped the real technique and do not realize how much force is used when winding round and tucking in the wrappers of their rigid and tidy little parcels? The necessity for this free movement allowing full expansion of the chest should be demonstrated and very emphatically insisted upon when instructing the inexperienced mother, who will have the subsequent care of the babe in her own hands. Fortunately most mothers are very gentle and afraid of handling their tiny offspring, so that they are less liable to swaddle them with homicidal firmness.

The special care of weakly premature babies is now well understood by the modern nurse, and these for a time at least will probably escape tight wrapping. Possibly overheating in electric incubators is a very real danger unless a reliable

thermostatic control is fitted. Presumably a baby suffering from artificial heat-stroke would have the symptoms of dehydration fever, and the cause of death would be "prematurity." Too great a weight of blankets on the infant's cot may possibly be a cause of fatigue of the respiratory muscles—and death. The zealous, harassed, but inexperienced mother should be warned of this risk. Is the danger fully realized?

Though, as already stated, I have not yet seen in print any expression of approval of my suggestion to have this matter thoroughly and conscientiously investigated, obstetric specialists in centres in this country and as far afield as Australia have expressed their complete agreement with my remarks. The surprise and disappointment of being ostracized on account of these letters by some with whom I had worked most happily for many years have been compensated by the (to me) unknown "feckless," anaemic, and frail little woman living under slum conditions, who had seen an extract of my letter in the lay Press, telling me that she had had no further trouble with her ailing baby after heeding the suggestion and abandoning the tight wrapping she had been taught.

Much of this may seem irrelevant as far as Dr. Lewis's article is concerned, but as the object of all of us is to save these precious lives I appeal once more to all doctors and nurses to satisfy themselves beyond all doubt that the infants under their care are not being slowly suffocated in the way described.—I am, etc.,

Huddersfield. S. H. WADDY.

Periarteritis Nodosa

SIR,—I was interested in Dr. L. M. Shorvon's case of periarteritis nodosa (May 3, p. 601). The difficulty of making this diagnosis during life lies in the diversity and the frequently changing character of the physical signs and symptoms in this condition. But it is just the great variety of the clinical picture—e.g., fever of the remittent type, tachycardia, polyneuritis, polymyositis, albuminuria and cylindruria, asthmatic attacks with bronchitis, hypertension, and leucocytosis with blood-eosinophilia—which is suggestive of periarteritis nodosa. The conception of periarteritis nodosa being the result of an extreme degree of vascular allergy has found wide recognition in recent years. It therefore seems doubtful whether this condition represents a disease entity but rather belongs to the wider group of diseases caused by the anaphylactic hyperergic reactions—e.g., Loeffler's syndrome, angioneurotic oedema, tropical eosinophilia, and probably rheumatic fever. The principal difference of these conditions lies in the intensity and extent of the vascular involvement. In a recent publication of two cases of periarteritis nodosa (A. Elkeles and L. E. Glynn, *Brit. J. Radiol.*, 1944, **17**, 368) we showed in serial radiographs of the chest the occurrence of transitory infiltrations in the lungs during the early stages of the disease. These were later superseded by persistent and progressive damage to the pulmonary vessels and bilateral pleural effusion. The presence of transitory as well as persistent and progressive changes in the lungs, with concomitant blood eosinophilia and the severe clinical picture, made a correct diagnosis possible during life. Transitory pulmonary infiltrations and blood eosinophilia are also met with in Loeffler's syndrome; but here the clinical picture is characterized by a mild course, and the lung infiltrations usually disappear completely within a few days, although in rare instances migratory pulmonary lesions may persist for several months.

In contrast to the striking radiological findings, physical signs of the lungs in Dr. Shorvon's case and in our cases were scanty and even absent. That is why little attention has been paid so far to the pulmonary changes in this condition, which, however, as shown by serial *x*-ray examination, may provide an important clue to this notoriously difficult disease.—I am, etc.,

London, W.1. A. ELKELES.

Heroin and Pethidine during Labour

SIR,—I would like to express appreciation of the scholarly paper by Miss Josephine Barnes (April 5, p. 437) on the use of pethidine in labour. Pethidine is certainly a safe drug to use and has many advantages. It has one very serious disadvantage, however, and that is that its action is unreliable. In Miss Barnes's series good analgesia was obtained in only 55% of cases, a figure in accord with my own much smaller experience of pethidine.

There is one drug, however, which is vastly superior to pethidine, and that drug is heroin (diamorphine hydrochloride). In analgesic effect heroin is much more powerful than pethidine, and its action is very much more reliable. When properly used it does not interfere with the normal course of labour and, as I have already shown in a previous communication (Jan. 8, 1944, p. 59), it can be safely given in full doses at any time during labour.

With experience one varies the dose according to the type and frequency of the contractions and the degree of dilatation of the cervix, but as a general guide one would say that 1/6 gr. (10.8 mg.) should be given when the cervix is three fingers dilated and a further 1/12 gr. (5.4 mg.) just before full dilatation. If the cervix is almost fully dilated or the second stage has already commenced when first seen one would give the full dose of 1/6 gr. (10.8 mg.) straight away. It is important not to give heroin too soon in the first stage, or else uterine action will be damped down. In this respect heroin differs from pethidine, which can be given earlier in labour. In those cases where the contractions are weak and some degree of uterine inertia is present I prefer to give pethidine rather than heroin.

When heroin is given in adequate doses, supplementary anaesthesia at the end of the second stage is not always required. When it is deemed necessary, a little chloroform or gas and air can be administered. For certain cases, particularly breech delivery, I find pudendal block very efficacious.

There are of course other aspects of the prevention and relief of pain in labour apart from the administration of analgesic drugs, and it is important not to neglect them. For example, there is the overcoming of fear and tension, and there are those measures designed to promote flexibility of the pelvic joints during pregnancy. The actual method which one employs to relieve pain in labour is probably of secondary importance. What is far more important is that everyone should master some method and apply it conscientiously. There is, unfortunately, far too much apathy and indifference among those who undertake maternity work. To make no attempt to relieve pain in labour, or to make only a half-hearted attempt, is a sign of slackness and a public confession of mediocrity.—I am, etc.,

Troon, Ayrshire. JAMES ROSS.

Artificial Insemination

SIR,—In the answer to a correspondent's inquiry about the technique of artifical insemination ("Any Questions," May 3, p. 625) you conclude: "Finally, attention should be drawn to the medico-legal aspects of this procedure," and refer him to a leading article on the subject in the same issue. While conceding that the leading article was intended to cover only a special aspect of the subject, I feel strongly that the answer should have included an admonition about the psychological as well as the medico-legal aspects. As your leading article points out, the legal status of the procedure and its consequences are still beset by doubts, but even a lay person unacquainted with formal psychology can hardly doubt that serious psychological dangers threaten all those who accept artificial insemination.

It is the clear duty of doctors and psychologists to point out the formidable hazards to happiness and peace of mind which confront all who resort to this expedient. The vital human factors, which should outweigh all other considerations, have received a minimum of attention or have been ignored as matters of small moment compared with the technical problems involved.

It is a fact that couples who request artificial insemination constitute a cross-section of psychological types. It is, moreover, by no means easy for even an expert psychologist to predict with confidence that any couple will not eventually experience strong emotional reactions which may become increasingly intense as the years pass. The manifold and ineradicable psychological difficulties which might wreck the lives of the woman who accepts A.I.D., her husband, and the "test-tube" child will be evident to anyone who gives the subject a moment's thought. However eagerly she may have resorted to the method in her desire for a child, the woman sooner or later is likely to experience a vague feeling of dissatisfaction with herself—what we might almost term a sense of sin, of

taint, or unwholesomeness. In spite of herself she is almost sure to indulge in morbid musings about the unknown father of her child, and she may tend to grow away from the husband who played no part in the deepest experience of her life. The husband, whose self-esteem was dealt a shattering blow by the mere revelation of his sterility, cannot help but consider the child a constant reminder of his "inferiority," and in time he may come to hate it and hotly to resent the attention which his wife lavishes on it. The child, an ambiguous figure at best, will be the most pitiful victim of these and other devastating and uncontrollable emotional consequences, which, to date, have received far too little consideration.

In the past I have administered both types of artificial insemination, but as a result of experience and reflection I would not now take any case except one in which the husband was the donor. I think it essential that all doctors, whatever their views, should present the psychological objections to their patients in the strongest terms.—I am, etc.,

London, W.1. EUSTACE CHESSER.

Complete Abortion without Initial Vaginal Bleeding

SIR,—The following case is of interest on account of the rarity of abortion occurring without warning uterine bleeding.

The patient, a para-3 aged 28, was seen in her own home on account of severe upper central abdominal pain of four hours' duration. The pain was colicky in nature, did not radiate, nor was it accompanied by vomiting, but was made worse by movement and deep breathing. Her personal history revealed the fact that she had been severely constipated for eight days and that she had not had a "proper" menstrual period for three months, although there had been some staining at the usual date of her period during this time. There was no history of previous abdominal colic.

On examination she did not look ill, temperature was 98° F. (36.7° C.), pulse 100, and there was generalized tenderness over the abdomen most marked in the right iliac fossa but without definite guarding. The rectum was loaded with hard faecal masses. Vaginal examination showed the uterus to be enlarged consistent with a 12- to 14-week pregnancy. There was no blood on the examining fingers nor on the vulva. The urine contained no gross abnormalities nor were there any physical signs in the chest.

Two soap-and-water enemata were given with good result and some relief of pain. Conservative treatment and observation was considered advisable and suitable. Next day the pulse had settled to 80, but there was still tenderness in the right iliac fossa, and the rectum was still loaded with faeces. Two further enemata were given with good result, so that the patient was free from pain on the third day.

On the fourth day of her illness the patient experienced a recurrence of mild colicky generalized abdominal pain indicating, as she thought, the need to use the bed-pan. Into the latter she passed a complete foetus of about 14-weeks size, along with a small blood clot. This blood was the only haemorrhage seen during the numerous visits paid to the patient. Recovery has been uneventful following curettage, when only a small amount of blood clot was removed.—I am, etc.,

Larne, Co. Antrim. H. E. RUTHERFORD.

Child Guidance

SIR,—Dr. Ian Skottowe in his letter (May 3, p. 616) speaks of (1) "the unnecessary confusion that there is on this subject," (2) "mental illness in children." The use of the term "mental illness" doesn't help much.

Most of the authorities are not agreed. The Association of Education Committees have recently stated that the educational psychologist should be in charge of child guidance clinics and not the psychiatrist. If we do as Dr. Skottowe suggests and "leave the matter there" the education departments with the psychologist in charge of the "centre" (and the psychiatrist an indispensable lackey) will have control of the "treatment" of most maladjusted children, delinquents, etc., while the medical department will be expected to deal with what? Mental illness? Psychotics, amounting to about ½% of children requiring psychological treatment? Or just the rejected enuretics and some encopreses?

In the meantime the Ministry of Education expects the medical department of the local authority to certify on the appropriate form the fate of educationally subnormal pupils (a definition of which is based not on the I.Q., by the way, but on the standard of achievement in the basic subjects). What sort of topsy-turvy chaos will exist? Dr. Skottowe may or may not know that in one of the Home Counties the educational psychologist is arranging all the child guidance clinics through the education department. If the medical department sets up "mental illness" clinics there will certainly be two administrations dealing with the children requiring psychological treatment.

I repeat my previous contention—namely, that where the school training (with the educational psychologist advising the chief education officer) has failed to prevent a child reaching a child guidance clinic or centre the child's problem is both psychological *and* clinical—psychological for obvious reasons which nobody denies, and clinical because in most cases there is a parental problem which should not be dealt with by a lay worker. For that reason all psychological misfits which the schools cannot deal with should be in the first instance directed to the school medical department. I am forced to this conclusion not through any motives of "will to power" for my faculty but sincerely in the belief that the educational psychologist, although far ahead of the psychiatrist in the technical armamentarium and skill of his profession, is nevertheless quite unfit to appreciate more than the surface of the parental problems. If by mental illness Dr. Skottowe (and for that matter the Ministry of Health too) means all psychological misfits, then Dr. Skottowe and I have no argument between us.

I disagree altogether with his dislike of the syntax of the term "child psychiatrist." He is just allowing his imagination too much scope. Is a child lover necessarily a minor? A bird watcher an animal? Or a rabbit hutch a rabbit?—I am, etc.,

Kingston-on-Thames. JOHN A. MCCLUSKIE.

*** This correspondence is now closed.—ED., *B.M.J.*

Nicotinamide and Diabetes Mellitus

SIR,—I was very interested to read Dr. H. J. Wade's article on nicotinamide and diabetes mellitus (March 29, p. 414). I have been working on the subject for the past year and have published a preliminary report on thirty cases in the *Journal of the Royal Medical Association of Egypt*, 1947, **30**, 29. I found that 60% of the cases of diabetes, mostly in the mild and moderate group, and a few in the severe group, do well on this form of therapy, as shown by the sugar-tolerance curves. Those that do not show any or only slight response are the juvenile diabetics, and some of each of the above groups, mostly the severe ones. Even in these cases the insulin requirements may be decreased.

I would like to point out that I used the same dosage as Dr. Wade, but that it takes four to six weeks to show any appreciable response and up to six months to show optimum response. I suggest that Dr. Wade did not follow his six cases sufficiently long, and that their number is inadequate for any conclusion.—I am, etc.,

Cairo, Egypt. SAID M. TALAAT.

Safety in Electric Convulsion Therapy

SIR,—The letter from Dr. R. A. Sandison (April 26, p. 579) is very important to me and, I hope, to many others. It could reopen the long and somewhat acrimonious correspondence which you received about anaesthesia, and it emphasizes the dangers of elaborating what should be a simple procedure. I have been forced by circumstance to be an anaesthetist, and am by inclination a psychiatrist. In both of these specialties I feel that the "human" element is disappearing, and the patient is now becoming a piece of physiological apparatus.

Some time ago I read in the *Journal* of a Service woman who had died during an operation for an "interval" appendix. She had received thiopentone to prevent her being upset by a spinal anaesthetic which had to be supplemented by gas and oxygen. One was left with the impression that any feeling about the summation of all those anaesthetics having been connected with the cause of death had been satisfactorily rationalized.

Likewise in E.C.T. I have lived with 600 epileptics for five years, and if one worried about everything that could happen to them (but yet so rarely does), one would have them permanently in bed under light thiopentone and *d*-tubocurarine chloride.

I only want to ask this question of my psychiatric colleagues (except Dr. Sandison, who is on my side). If you had to have E.C.T., wouldn't you like to have the button pressed *first*, and an adequate routine laid on to prevent your injury and/or demise after you were "out," or would you, like me, probably die of fright, before you could be resuscitated, when you had (1) been buckled into your canvas jacket; (2) had your straps secured; (3) had your leather headband put on; (4) received your injection/injections, or any other refinement calculated to prevent your receiving an injury which may never happen if the simplest method is used, and would be better than dying of (*a*) fright and (*b*) medication, anyway?—I am, etc.,

Dartford, Kent. J. MACKAY CRAWFORD.

Folic Acid

SIR,—I have been interested in the leading article (May 3, p. 604) concerning folic acid as a therapeutic agent, and perhaps I may be excused for bringing to your notice a single case of subacute combined degeneration of the cord which has recently been under my care.

The patient, a male aged 55 years, when I saw him first had been suffering for three months with loss of power in the legs, unsteadiness, marked sensation of cold spreading up the legs when standing, tingling, and numbness. On examination the findings were those of a spastic ataxia, the blood that of a pernicious anaemia. He could not stand without support and walked only with help and with a markedly spastic and ataxic gait. Intensive liver treatment was started on March 20 and continued for three weeks, with marked improvement in the blood state but only slightly in the nerve condition.

I then administered folic acid 10 mg. daily and gave a maintenance dose of liver weekly. Within a few days a marked improvement took place and has continued since, reaching a climax to-day, when I saw him walking, using a bicycle as a partly moral and partly physical support, a mile distant from his home.—I am, etc.,

Birkenhead. CECIL L. FORDE.

Shortage of Nurses

SIR,—Dr. R. Howell Roberts suggests (May 10, p. 655), that professional examination of "orderlies" for higher rank in the three Services should be brought into line with civilian standards. Surely, Sir, the boot is on the other foot! Sick berth ratings passed for higher rates in the Navy, their opposite numbers in the other Services, and the V.A.D.s who have had similar training and experience during the late war are recognized as nurses fit to be entrusted with the care of the sick in the Services.

If the General Nursing Council could forget its obsession with examination standards and its own importance it might make a real contribution to the serious national shortage of nurses by accepting these ex-Service men and women as qualified nurses and granting them State registration on their discharge from the Services, with recommendation for such registration by the relevant Service medical authorities.

No man or woman after several years of responsible nursing will consider beginning again to "train" for the State Registered Nurse examination under existing rules, but many are experienced nurses well worthy of inclusion in the Register forthwith. The General Nursing Council must get down from its high horse and face the facts.—I am, etc.,

SURGEON COMMANDER, R.N.

Congenital Malaria

SIR,—Dr. P. G. Preston's letter (March 29, p. 422) impels me once more, as on a similar occasion last year, to attack the complacency of reporters of alleged instances of the above alleged syndrome. As a much examined student from whom examiners require much accuracy of statement and quotation, I deplore the almost universal failure of reporters in this field to present their alleged facts, which may be facts indeed, in anything remotely approaching a scientific or factual manner which can readily be understood and accepted.

To quote from the letter under "deplorement": "blood was taken . . . on three consecutive days following its birth." Were these the first three days after birth, or the 8th, 9th, 10th, or the thousand-and-first, etc.? And again: "out of 700 patients examined 40 mothers were found to have malaria parasites in the placental blood, and two infants." This second phrase gives no factual information and is capable of various interpretations, among them a comical one, which is, however, relevant to my argument—i.e., that twin infants were found in the placental blood. The latter interpretation calls to attention one of the many factors which have to be considered and eliminated before a true bill can be presented for congenital malaria, that is, the possibility of post-partum infection by placental or maternal blood through abrasions, the severed cord, or even the delicate mucous membranes of the infant.

As I contended on a previous occasion, few if any alleged discoverers of congenital malaria have advanced fool-proof scientific evidence of their discoveries—at least not enough to satisfy an advanced student.—I am, etc.,

India. STUDENT No. 2.

Responsibility for Drugs Supplied

SIR,—I would suggest an alternative to the "disturbing and crushing alarm" expressed in the medico-legal article (March 29, p. 428) at the prospect of practitioners' being liable to heavy damages for the possible damage done to their patients by new preparations recommended by drug-retailing firms. Instead, should we not perhaps take it as a timely warning of the bad state into which our clinical medicine to-day is drifting? Did each of us do six or more years of intensive study to be led continually "by the nose" by laboratory chemists and the large financial considerations that are behind the drug-retailing firms? Why do we experiment on our patients on the advice of attractive pamphlets that litter our breakfast-tables each morning?

I would suggest that it is chiefly due to two reasons which we might well try and rectify immediately: (1) The inability of the average overworked practitioner to attend refresher courses at least every two or three years. In consequence of this he is much too much a willing victim to the commercial drug concerns in a blind effort to keep up with the times. (2) If in our student years and in the medical literature thereafter *disease* was analysed and studied *a little less* and a positive approach to the natural health of body and mind synthesized and considered *a little more*, then perhaps our impulse to be influenced by the often ignorant demands of our patients for useless bottles of medicine and possibly harmful injections would be changed to a bold, clear resolve to attempt to change and remedy some of the many bad habits of living and eating of our time.

The cycle of a healthy soil through natural composting leading to healthy, pest-free vegetation and thence to healthy, disease-free animals has already been overwhelmingly scientifically proved after the artificial manures, chemical sprays, and injections had all lamentably failed. Man is an intrinsic part of that cycle, and the sooner that we use fewer bottles of medicine, sprays, and injections and help our patients back into that natural cycle of real health that the more progressive agricultural experts have already discovered and utilized so the sooner, among the many enormous benefits to mankind, will be solved the little problem of safeguarding our pockets from harm we may do our patients, because such a state of affairs will happily no longer arise.—I am, etc.,

Madeira. H. P. KILSBY.

William Blake Psychologized

SIR,—It was only to be expected that, with the contemporary break-up of social organization, there should to-day show itself a parallel tendency to mental dissociation, taking many forms and constituting the starting-point of numerous serious psychopathies. Although personally unacquainted with William Blake's prophetic books, I am interested to read that the strange *dramatis personae*, with their uneouth names, in these poems represent symbolically a "disintegration" of the soul or uncon-

scious mind. It appears that a recent exponent of this poet's teaching, Mr. W. P. Witcutt (*Blake: a Psychological Study*), interprets him according to the system of C. G. Jung, of Zurich, as a "dissociated introvert," as one whose inner vision has become disintegrated into its "elements"—these elements then appearing as the "gigantic figures," "spectral illusions," etc., of his dreams and imaginative works.

But if this is possible of the individual's inner vision, why not of his outer also? One recalls that the "nature spirits" of folklore and the "minor deities" of polytheism in general have already been interpreted along these lines. Further, according to this conception, all these subsidiary divinities represent less a stage in an approach to monotheism than a lapse away from it, attributable to a slackening mental grip, a dissociation *à la* Pierre Janet. It will be interesting to note whether folklorists recognize the parallelism; the recognition should be illuminative both to them and to pyschopathologists.—I am, etc.,

North Queensferry, Fife. A. J. BROCK.

Lectures from Edinburgh

SIR,—Prof. L. J. Witts has reviewed (May 3, p. 602), under the above title, the third volume of the *Edinburgh Postgraduate Lectures in Medicine*, which is published through a grant from the Honyman Gillespie Trust. As chairman of the committee which was responsible for the invitation to the lecturers and for the issue of these lectures in the *Edinburgh Medical Journal* from time to time and at a later date in book form, I would take exception to some of his criticisms, which show a lack of appreciation of the purpose and value of these publications. The reviewer, it is true, pays a compliment to the thirty-two lectures which comprise this volume when he writes that they exemplify "the high level of didactic teaching characteristic of the Scottish schools of medicine," but he makes no mention of the fact that the lectures were all delivered by experts dealing with aspects of their respective subjects in which they were particularly interested and that, since they are replete with the lecturers' personal views, experience, and original observations, they are definite contributions to knowledge. The present volume and a fourth would have been published before now but have been held up by the paper shortage.

I may say that I do not agree with Prof. Witts that the day of the published clinical lecture has passed, for personally I have derived much benefit and pleasure from the perusal of the clinical lectures published by some of our great clinicians. The clinical lecture affords, does it not, an opportunity to express and emphasize the art as contrasted with the science, an aspect of medicine which, as many clinicians will agree, often does not receive in our teaching nowadays the attention which it demands. Prof. Witts makes no attempt to assess the value of the individual lectures. Indeed he finds this volume "more difficult to read than any recently received volume." "It is difficult," he writes, "for any one reader to be interested both in the Control of Sepsis and in Delinquency, in the First Month of Life and in Prostatic Enlargement." I agree that such diverse topics are not likely to appeal to the purist. On the other hand a volume of the kind is appreciated by the general practitioner who wishes to keep abreast of the times and by many others who attend these lectures.

I was personally responsible, and make no apology, for advising the Honyman Gillespie trustees to permit the utilization of their grant, according to the terms of which animal experiments may not be referred to, for the delivery and publication of these lectures, which illustrate some of the clinical activities of the Edinburgh School; nor shall I apologize for their subsequent publication in book form, which, I submit, fulfils a most useful purpose. Prof. Witts concludes that "Only pious devotion to an *alma mater* would justify the purchase of these addresses." But even if this were so, which it is not, for these volumes appeal to graduates of many other schools, is not this a worthy motive? Is it not the case that both Bart's and Guy's, to the staffs of which Prof. Witts was, I think, at one time attached, publish their *Hospital Reports*?—I am, etc.,

Edinburgh. EDWIN BRAMWELL.

POINTS FROM LETTERS

Heat and Certificates

Dr. LINDSEY W. BATTEN writes: Every new infringement of liberty, the almost daily "thou shalt not," the rare but not popular "thou shalt," trails after it a countervailing medical certificate. For the bureaucrat we are the indispensable mediator between him and the disillusioned elector, softening and making just bearable the injustices and absurdities of his edicts; for the reluctant citizen of every social class and political party we are the dispenser of privileges, the annuller of obligations, the anaesthetizer of the pricking conscience. The pressure upon us to perform these functions is very great; often it amounts to compulsion. Save in retirement there is no escape from acting as the universal unpaid arbitrator and referee in innumerable cases of Rex *v.* Smith. Yet all this has no part in the Hippocratic Art; it is not for this we took to medicine; and the functions we perform are of the most dubious ultimate value either to the citizen or the State. The crowning absurdity has come in the demand for gas-and-electric-fire certificates. Parliament has approved a law which the Government admits it cannot and will not try to enforce. Many members of Parliament have protested that it must be widely disregarded and every practitioner must know from his experience of the last four months that they are right. The thoughtless, the wasteful, the disgruntled will turn on their heaters whenever they feel cold, and no class has a monopoly of these folk. . . . Without far clearer definition of the clinical conditions supposed to justify electric heat in England now I trust we shall all decline to give any certificate, leaving Government and citizen to work out their own salvation.

"Ectopia Testis with Seminomatous Change and Torsion"

Dr. A. H. BENNETT (Hartford, Cheshire) writes: With reference to the article "Case of Ectopia Testis with Seminomatous Change and Torsion" which I communicated to the *Journal* with Dr. D. W. G. Shaw on Feb. 15 (p. 256), I have recently received from Dr. John Burke, of Buffalo, New York, a copy of an article contributed by him to the *Zentralblatt für Chirurgie*, 1938, **65**, 2821, entitled "Stielgedrehtes intraabdominales Seminoma Testis." The case history is remarkably like our own, but it may be worth noting that he has furnished a quantity of bibliography, which I add, namely:

Bulkley, K., *Surg. Gynec. Obstet.*, 1913, **17**, 703.
Eisendrath, Daniel N., and Rolnick, Harry C. *Textbook of Urology for Students and Practitioners*; Philadelphia and London: I. B. Lippincott. 1930.
Rea, Charles E., *Amer. J. Cancer*, 1931, **15**, 2646.
Young, Hugh H., and Davis, David M. Young's *Practice of Urology*; Philadelphia and London: W. B. Saunders. 1926.

Association of Operating Theatre Technicians

Mr. A. WARNER writes: For many years in the larger hospitals in London, also in some other towns in the country, men have been employed as orderlies or theatre porters in the operating theatres. . . . Now a body of men with many years' experience in theatre work have formed an association under the heading of the "Association of Theatre Technicians," and many London surgeons and anaesthetists have offered them a backing, the idea being that in future anyone wishing to be employed in the capacity of a theatre technician shall have a course of training and instruction in the whole of theatre technique and will need to be thoroughly conversant with the working of the theatre, its instruments, apparatus, and the general procedure pertaining to the theatre. . . . Information will gladly be given by the Hon. Secretary, Mr. A. Warner, 56, Firwood Avenue, St. Albans, Herts.

"Is it, Doc.?"

Dr. P. K. MURPHY (London, W.) writes: Dr. Stuart Warden's story (May 3, p. 617) of his 18-year-old patient who, when asked whether her bowels were regular, appealed to her mother, "Are they, Mum?" was very, very amusing. But is it any less comic than his conclusion? We are asked to accept the incident as an overwhelmingly true summary of modern State education. Dear, dear! Surely all it indicates is that no matter what system we adopt there will ever, unfortunately, be a mentally sloppy, half-baked few who cannot be relied on to know their acetabula from their elbows.

Retaining Fees

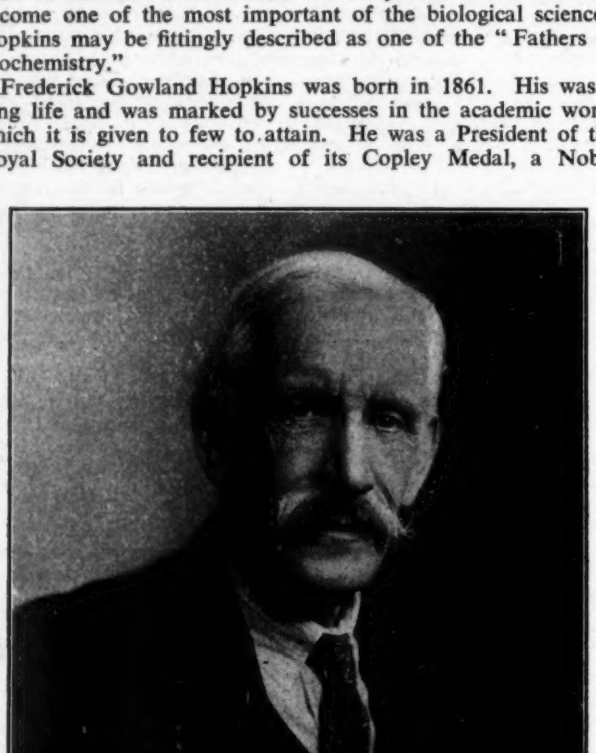
Dr. P. B. CORBETT (Norwich) writes: At least three times this year I have been awaiting confinements which have been from two to three weeks overdue. This has been a great source of inconvenience, as very important engagements have had to be abandoned. Lawyers have a refresher fee per day marked on their brief; is it not possible for us to adopt a somewhat similar course—a retaining fee for every day or week over the booked date?

Obituary

SIR FREDERICK GOWLAND HOPKINS, O.M., LL.D., Sc.D., M.B., F.R.S., F.R.C.P.

The death of Sir Frederick Gowland Hopkins, which took place at Cambridge on May 16, brings to an end the life of a notable man of science who has seen the subject he made his own become one of the most important of the biological sciences. Hopkins may be fittingly described as one of the "Fathers of Biochemistry."

Frederick Gowland Hopkins was born in 1861. His was a long life and was marked by successes in the academic world which it is given to few to attain. He was a President of the Royal Society and recipient of its Copley Medal, a Nobel



[*Lafayette, Ltd.*

Prizeman, and virtually the founder as well as the first professor of his subject at Cambridge. His achievements were recognized by the Crown by the bestowal of a knighthood and of the Order of Merit, by many foreign as well as British universities by honorary degrees, and by the bestowal of medals and prizes by learned societies.

The reality of greatness is never easily achieved, perhaps because adversity in one form or another is a reagent necessary fully to develop the finest shades of the human character; and until at least middle life Hopkins had to struggle against heavy odds. Lack of means is a common enough obstacle in the path of a man who wants to fulfil what he knows it is in him to fulfil. But financial difficulties, even had they been severe, would have probably troubled Hopkins less than they would have many other men. Though his father died in Hopkins's infancy he was brought up by his mother and uncles in a comfortable home. His schooling was brought to an end at an early age as a matter of policy, not of necessity, and he was initiated at once into the insurance business. Though he was to be among the first scientists of his age, he had no formal scientific education at all. After a relatively short career as an insurance clerk he succeeded in gaining his point that he should be allowed to embark on a scientific career. It was almost decided that he should go to Cambridge, when a chance and most unlucky lunch-time conversation between one of his uncles and a City acquaintance resulted in the abandonment of the university project and his apprenticeship to a practising analytical chemist. The decision, made in all good faith, rested not on any financial or other objection to a university career but on the supposed superior merits of the apprenticeship as a means of scientific education. The chemist, in fact, used him solely as a junior laboratory assistant. A few attendances at a course of lectures at South Kensington (the only lectures on chemistry that he was ever to hear) were followed by the winning of a gold medal. This happened to coincide with the termination of his apprenticeship and was followed by his first salaried post, with another analyst. On receipt of his first cheque from this employer—£40 for six months' work—he jokingly suggested framing it: his employer took the proposal seriously and supported it with warmth. About this time Hopkins was carrying on his first independent research on butterfly pigments—partly in the scullery of his mother's home at Enfield.

It was, fortunately, not long before he came in contact with, and was taken as assistant by, Dr. (afterwards Sir Thomas) Stevenson, then Home Office analyst. This involved him in medico-legal work of an interesting kind. It also brought him to Guy's Hospital. Imbued with the spirit of investigation, he won the Gull studentship, and was able to continue his research along with his other duties. These came to include the teaching of pre-clinical subjects, and he determined to obtain a medical qualification. To do so he must first pass the London Matriculation, which involved the study of long-forgotten Latin. Since his relations would have been deeply hurt had he shown himself unwilling to spend his evenings "socially," his only opportunity for doing this extra work was during the daily train journey between Enfield and London. This, however, appears to have been no great obstacle, and in almost the shortest possible time (he was once "ploughed" in midwifery) he obtained the London M.B. in 1894, together with the Gold Medal, having taken the B.Sc. four years earlier.

The next phase of Hopkins's career was clinical. His now extensive, if unconventionally acquired, training in chemistry naturally directed his interests towards diseases of metabolism and problems of nutrition, and he began to acquire (probably without intending to do so, for he continued his Home Office work) a not inconsiderable consulting practice. He was also associated with one of the first laboratories which provided facilities for the general practitioner. It was among the Guy's out-patients that he was impressed by the fact that patients who apparently had enough to eat could still be badly nourished.

At this point came the great change in his career. Had he remained in London he would certainly have rapidly acquired a lucrative practice. Essentially humanitarian and sympathetic, he would have been happy in his contact with patients. Michael Foster, however, then Professor of Physiology, invited him to Cambridge as lecturer in chemical physiology. He accepted. His task was not an easy one. His lectures and practical classes had to be created *de novo*. No apparatus to speak of was available. Michael Foster's death deprived him of much of the support on which he had counted. The lecturer's salary was almost nominal, and though a Fellowship at Emmanuel much improved his income it necessarily exacted a rather heavy toll of teaching work outside his own subject. His subsequent election to a tutorship at Emmanuel imposed even more duties, though his personal qualities endeared him to his pupils. But during this time he built up his subject in the university—not always with helpful co-operation from his immediate colleagues—and carried out his pioneer work on vitamins and on the metabolism of muscle. His lectureship had meanwhile become a readership.

In 1914 the university created for him a Chair of Biochemistry. The post carried no stipend, but Hopkins was simultaneously elected to a Fellowship at Trinity and made Praelector of that college, a post carrying a salary but no duties. This relieved him of much of the burden of extra departmental work. It was neither the first nor the last time that the university's greatest college has come to its aid, and that of learning, in such a fashion.

As was natural, many tasks were laid upon Hopkins from without. He was one of the original members of the Medical

Research Committee, and with Sir Walter Fletcher had much to do with the shaping of its policy. He served on many boards and committees. He had, however, no real taste for administrative work: first and last he was an investigator, and the strenuous times during which his department was expanding rapidly and the new laboratory was being built (funds for which, with endowment for the Chair, came from the Sir William Dunn bequest) saw also his investigations of biological oxidation mechanisms. This work, notable in itself, inspired a great volume of work not only in this country but throughout the world.

Hopkins was an inspiring teacher, especially of small classes. His policy as head of a research department was peculiarly his own. Many great experimenters focus the whole resources of their department on to the problems in which they are personally interested. Hopkins seldom had more than one or two personal assistants or collaborators; temperamentally he was not an "organizer" of research in the usual sense of placing himself at the head of a team. On the contrary he encouraged in his department the pursuit of many different lines of work, followed sometimes by different individuals, sometimes by small groups of workers. The result has been a department where discussion and criticism, and the introduction of new techniques and new ideas, have been unusually easy. Visitors came to Hopkins's laboratory from all over the world and never went away without profit to themselves or, indeed, without benefit to Hopkins and his colleagues.

Hopkins had that one hallmark of a great man—real humility of spirit. He was completely devoid of improper pride and pomposity. Though his long life was spent in the laboratory he was always glad he had taken a medical degree. He was a member of the B.M.A. for over forty years and was President of the Section of Physiology and Pharmacology at the Annual Meeting in Cambridge in 1920.

Hopkins married in 1898 Jessie Anne Stevens, and had three children. His son-in-law, Dr. E. G. Holmes, has been university lecturer in biochemistry at Cambridge since 1933.

We are indebted to Sir Henry Dale, O.M., F.R.S., for the following appreciation of Sir Gowland Hopkins's scientific work:

Even at a relatively early stage of his career Hopkins, if he looked back on what he had done and discussed what he hoped to achieve, would speak of his real aim in research as being to unravel some part of the intricate complex of linked chemical reactions, catalysed by enzyme systems, which constitute "intermediary metabolism"—the essential chemistry of life. To such an attempt he regarded all his earlier work as preparatory, and, when opportunity gave him at length an organized department, it was in this direction that he guided the interests and ambitions of his pupils and of the many visitors who came to work under his inspiration. When Hopkins was at the beginning of his work the chemical study of the animal body and its products had become a mere branch of physiology, having some links of practical method with clinical medicine. Chiefly a chemistry of end-products, it had almost lost an earlier and short-lived attraction for "organic" chemists and was not everywhere in great repute with physiologists. He had been conscious of the need to win respect for this "chemical physiology," by the achievement of results to which chemists as well as biologists must give attention, before the advance towards the real objective could begin. Hopkins lived to see "organic chemistry" returning, with rapidly growing interest and with immensely greater resources of method and theory, to its original objective of the structure and properties of the relatively stable end-products stored or excreted by animals and plants. He lived also to see the new dynamic chemistry of intermediary metabolism, in the foundation and building of which his work and his influence had played such a great part, achieving recognition as the essential "biochemistry."

On the way to this ultimate objective Hopkins's work had dealt with a number of apparently separate problems in vital chemistry, so that his career as a research worker seems to fall into periods. In the first he was bringing to the point of publication the work on the pigments of the wings of certain butterflies and their relation to uric acid, begun so early but not published until 1895, when he was already 34 years of age. In his latest years he actually returned to this earliest of all his problems. To the same early period belongs his work on human purine metabolism, including the introduction of what remained for years the standard method for determining uric acid. Then came the period of protein and amino-acid chemistry, beginning with practical methods for crystallizing certain albumins in any required quantity, and culminating in the discovery and isolation of tryptophan. This latter led to the study of the necessity of individual amino-acids in a mammalian diet, and thus, apparently, to the recognition of the inadequacy, for growth and maintenance, of a diet in which the organic constituents—protein, fat, and carbohydrate—had been rigidly purified from traces of unknown factors. This fundamental step towards the recognition of the vitamins, now engaging the attention of such a large proportion of the world's biochemists, was mentioned by Hopkins in a lecture as early as 1907, though circumstances delayed the publication of his detailed experimental evidence till 1912, when the "accessory food factor" or "vitamin" conception was already in the air. Hopkins gave the first clear demonstration that it was no defect of appetite or absorption but a fundamental failure of the metabolism to deal with the adequate quantities ingested and absorbed which created the deficiency of the pure diet, and that a relatively minute addition of fresh milk completely repaired the defect. Meanwhile, in 1906, he had published with the late Sir Walter Fletcher the results of the first experiments which he made directly on a problem of intermediary metabolism—the production of lactic acid from carbohydrate in active or injured muscle, and its removal in the intact muscle by oxidation.

It is somewhat remarkable that Hopkins, having been concerned in the same period with two such fundamental researches, from each of which resulted a great new outburst of activity and progress in biochemistry, should have left almost entirely to others the direct exploration of the wide vistas thus opened. His attention, and that of the band of able and devoted pupils who began to gather round him, turned rather in the direction of the enzymatic mechanisms of oxidation in the respiration of the single cell. The isolation of the natural tripeptide glutathione and the complete identification of its structure was, perhaps, Hopkins's culminating individual contribution to this series of investigations. The elegant method which he finally found for the separation of this substance may be compared with that which he had earlier used for the isolation of tryptophan, each affording an example of his apparently instinctive choice of a selective but slightly unconventional reagent for a particular purpose. It may be noted that it was in Hopkins's Institute also that Szent-Györgyi later, as a visiting worker, first isolated ascorbic acid; and that it was in the neighbouring Molteno Institute—not under Hopkins's direct inspiration indeed, but not beyond the range of his stimulating influence—that Keilin identified the cytochromes. The study of the reactions of these reversibly oxidized substances and their relations to the activities of different oxidative enzymes has played a large part in the astonishingly rapid development of knowledge of the linked series of reactions involved in cellular oxidations. Another very important contribution to this advance has been made by the succession of Hopkins's pupils who have studied and differentiated the specific oxidative enzymes which can be detected in the cell bodies of living, but not actively multiplying, bacteria of different kinds. The Cambridge School of Biochemistry became, in fact, under Hopkins in his later years a world-famous centre for those investigations on intermediary metabolism towards the initiation and development of which he had been consciously striving throughout his career. He had taken no direct part in the researches, so swiftly extending to the laboratories of all countries, by which individual vitamins were recognized, identified, and produced by artificial synthesis in astonishingly rapid succession, and in a series of which the completion is not even yet in sight. It must have given him a peculiar pleasure, however, to see the specific function of one such pure vitamin after another determined and found to be that of an oxygen carrier or a coenzyme essential to some phase of the complex reactions of intermediary metabolism. For thus the discovery most frequently linked with his name in popular esteem and public recognition, as that having the most directly practical application to the betterment of human and animal health, has been brought into an ever closer relation to the deeper problems which had so long held his interest and provided the true goal of his scientific ambition.

SIR ALMROTH WRIGHT

Major-General Henry B. H. Wright, C.B., C.M.G., writes: Yesterday I received a copy of the *Journal* dated May 10, and read your obituary notice of my brother, Sir Almroth Wright. It contains some inaccuracies which you may think worth correcting. He died at his residence, Southernwood, Farnham Common, Bucks. He gave up his London house in Pembroke Square in 1940. After getting his degrees at Trinity College, Dublin, with the funds received from the medical travelling prize he proceeded to Germany. On his return from Germany, seeking immediate means of existence, he took a scholarship at the Inns of Court but dropped his legal studies when he passed into the home Civil Service and was appointed to a clerkship at the Admiralty. When his day's work at the Admiralty was done he spent the rest of his day at the Brown Institute, and while still a Civil Servant was awarded the Grocers' Company's research scholarship. With the means thus available he was enabled to resign his appointment in the Civil Service and go to Cambridge University for further study.

He was educated largely on funds provided by the benefactions of others and to some slight extent contributed to the education of others by sending a cheque for £2,000 last year to the funds of T.C.D.

Sir Thomas Houston writes: While appreciating in a high degree the well-merited prominence you have given in the *Journal* of May 10 in the obituary and editorial to Sir Almroth Wright, the members of the profession here were somewhat disappointed that more emphasis was not laid on his connexions with Ulster. Perhaps you will allow me to add some details to what you have said in this context.

Sir Almroth was born in Richmond, Yorkshire, in 1861, shortly before his father, the Rev. C. H. H. Wright, an Ulsterman, was appointed rector of St. Mary's Parish, Belfast. During his early days he was educated at the Royal Academical Institution, Belfast, and afterwards at Trinity College, Dublin. In his own province—at the Annual Meeting of the British Medical Association in Belfast in 1909—he was president of the Section of Haematology and Vaccine Therapy, a section designed to do honour to his work on the blood and on vaccine therapy. In 1912 Belfast gave him the Freedom of the City, and in 1927 the Queen's University conferred on him the honorary degree of Doctor of Laws. He made several communications before the Ulster Medical Society and was an honorary fellow of that Society. The laboratory workers of Ulster owe much to the scientific work of Sir Almroth and to the stimulus of his personality and methods. They always received a warm welcome from him and his staff when they visited St. Mary's Hospital. I remember on one occasion I mentioned the success of his typhoid prophylactic inoculations. He replied somewhat as follows: "I would consider it a much greater achievement if I could teach my pupils to make logical deductions and use accurate technique. I would say to them with Pasteur, 'Come away from these polemical discussions, come and be taught methods.'" Lord Moran has described Sir Almroth Wright and his distinguished pupil, Sir Alexander Fleming, as "the two doctors who have saved more lives in the field than anyone else in the world."

Dr. MARY ARIEL STEWART DEACON, formerly of Liverpool, died in Carlisle on April 18 at the age of 75. A native of Somerset, Dr. Deacon was educated at Cheltenham College and at the London School of Medicine for Women. She graduated M.B., B.S. in 1899 and two years later she married Major Thomas Deacon, who was then Postmaster-General of the Gold Coast. She worked there as medical officer of health at Accra for some years. Then in 1916 she was appointed medical officer to the Royal Army Ordnance Depot at Aintree and continued in this appointment until 1919, when she became assistant medical officer of health for Birkenhead. She took her D.P.H. in 1922 and was in public health work in Birkenhead for seventeen years, until her retirement towards the end of 1936. She was at one time president of the Liverpool Women's Medical Association and was appointed M.B.E. in 1918.

D. M. M. writes: Dr. Deacon, who was a strikingly handsome woman, had a colourful, courageous, and lovable personality. Her career was varied and full of incident, and she made friends wherever she went. She will be remembered by countless patients and personal friends for her warm-hearted generosity and the buoyancy of her spirit.

Mr. ARTHUR W. DOWN, founder of Down Bros. in 1879, died at his home on April 2 at the age of 95. Mr. Down had been a governing director of the company since 1902 and he had entered the industry as early as 1866. He was actively interested in the business up to the last few days of his life, and he will be greatly missed by the friends he made in the course of a long business career which brought him into contact with many doctors.

Medico-Legal

INSTITUTE OF ENDOCRINOLOGY

The Institute of Endocrinology Ltd., of 31, Heath Drive, Hampstead, N.W.3, and Jacques J. Harpman, an M.D., of La Plata University, were fined £100 with 12 guineas costs at Hampstead Court on Wednesday, May 7, on six summonses relating to the publication of a booklet "Hormone Therapy" advertising preparations for the treatment of epilepsy, infantile paralysis, and diabetes.

Mr. A. C. Castle, prosecuting for the Pharmaceutical Society of Great Britain, drew attention to the Pharmacy and Medicines Act, 1941. Under the Act, he said, it was an offence for any person, even a doctor, to advertise an article which might be used to treat a number of diseases which might be called very difficult or hopeless diseases. Under section 8 a number of such diseases were listed—in particular it mentioned diabetes, paralysis, and epilepsy. In October, 1946, a Mr. John F. Armstrong wrote a letter to the Institute asking for particulars of a certain treatment. He received in reply a list of ailments treated by the defendant Company. The three diseases complained of were mentioned. In the same envelope was a booklet entitled "Hormone Therapy." It was apparently a booklet intended to impress on readers the importance of glands, all glands, and in particular the pituitary, the thymus, and the pancreas. Regarding those three it mentioned *inter alia* that they were respectively responsible for epilepsy, infantile paralysis, and diabetes. In another part of the pamphlet were the words "glands seldom work correctly. . . . Restore balance by our fresh hormone preparations."

Mr. Harpman was interviewed on Feb. 11 by an inspector of the Pharmaceutical Society. He said he had qualified as a doctor in South Africa in 1903 and was in practice until 1930. He took his M.D. at La Plata University. He was 69 years old. In 1930 he founded the Institute of Endocrinology. The booklet was published in 1935.

Mr. Christmas Humphreys, defending, said the Institute had done a great deal of good work. There had never previously been any complaint. From 1932 to 1939 the Institute was at Baker Street and it had an enormous practice. Over 200,000 copies of "Hormone Therapy" had been sent out. Then came the Act. The Act discussed "hopeless diseases," and it said no person should claim to treat them. "He may treat them, he may cure them, but he mustn't claim them. He mustn't advertise." The defendants had to plead guilty to claiming to do something which they probably did do. Regarding the sending of the pamphlet, Mr. Humphreys continued, there are about two dozen left in existence. Somehow Mr. Armstrong was sent the wrong booklet. Since then a new pamphlet had been issued. Mr. Humphreys asked for leniency on the grounds of the long-standing good record of the Institute and of Mr. Harpman the managing director.

Failure of a Restrictive Covenant: Correction

Messrs. G. D. CANN and HALLETT, Exeter, write: You state in the second paragraph of your report (May 17, p. 700) of the case in the High Court and Court of Appeal, *Routh and Wilson* v. *Jones*, that our client, Dr. C. G. Jones, "left the service of the partners and bought a house in Okehampton, intending to set up in practice." This is not the case, and the true facts were clearly stated in the evidence before Justice Evershed, and in the judgment. Our client had no intention of starting practising in Okehampton when his contract of service was determined by the partners. This house was, in fact, bought before this occurred; therefore this report is not correct and we must ask you to amend it.

Medical Notes in Parliament

SCOTTISH HEALTH SERVICE BILL
COMMITTEE STAGE

On May 12 the House of Lords went into Committee on the National Health Service (Scotland) Bill. On Clause 3 the Duke of MONTROSE moved to add to the purposes laid down in the Clause the provision of clinics for otological and aural aid services. Lord Rosebery and Lord Cecil of Chelwood supported this amendment.

Lord MORRISON said he agreed with the points that had been put forward. The time was overdue for a campaign throughout the country to give more prominence to this subject. More attention should be given to deafness and the Government had decided to enlist the aid of scientists to make a deaf-aid which could be relied upon and supplied at a reasonable price. Contracts had been placed for an initial supply of 50,000 instruments, of which Scotland would have a fair share. Immediately the Bill was passed preparations would be made to establish throughout Scotland centres where these deaf-aids could be serviced. It was inadvisable to put into the Bill the words which the Duke of Montrose proposed. Subsection 1 of Clause 3 placed on the Secretary of State the duty of providing hospital accommodation, medical, nursing, or other services required in hospitals or clinics or services elsewhere. The term hospital included clinics and out-patient departments. Clause 3 also made it clear that the duty of the Secretary of State included the provision of appliances. This provision would be made in hospitals and also in out-patient departments, clinics, and health centres. The Clause did not specify the various kinds of aids and it was impossible to single out deafness for special mention. It would be out of the question to specify all the complaints for which aids were to be provided. There was on the statute book a special Act of Parliament dealing with the arrangements and treatment necessary for cancer—the Cancer Act of 1939—but that Act was now repealed and cancer found no mention in the present Bill because the Government concern was for the treatment of all kinds of ailments. After further discussion the amendment was negatived.

Consultation on Teaching and Research

Lord SELKIRK moved to provide in Clause 3 that the Secretary of State in making available facilities for undergraduate and postgraduate clinical teaching and research should do so "after consultation with the universities and the Royal Medical Corporations." He said that in the Bill the hospitals formed a pyramid with the Secretary of State at the top. The medical schools were entirely separated. The only assured contact was on the board of management of individual hospitals or groups of hospitals. In medical education the Secretary of State should look directly to the universities to provide him with advice.

Lord MORRISON said there was nothing in the Bill to debar the universities from a direct approach to the Secretary of State on any difficulty which was not resolved at the regional level. The duty of the Secretary of State under this subsection would not be carried out by himself personally but by the regional hospital boards, acting as his agents. These boards were advised on this aspect of their work by the medical education committee which would be set up under Clause 11. That committee included university nominees. Continuous discussion should not go on with the universities on all questions but merely on questions not resolved in the ordinary way. The machinery of the medical education committee provided in the Bill was put in at the suggestion of the universities. Lord Selkirk withdrew his amendment.

On Clause 5 Lord ROSEBERY moved to provide that special accommodation previously used for patients who undertook to pay should be so set aside subject to accommodation remaining available for other patients. He said that if the amendment was not accepted there would be a mushroom growth of private nursing homes.

Lord MORRISON said that the amendment was similar to one rejected by the House of Commons. He was unable to accept it.

Voluntary Hospital Endowments

On Clause 7 Lord TWEEDSMUIR moved to provide that where property comprised in an endowment was applied to the discharge of liabilities transferred from a voluntary hospital these liabilities must be liabilities which had been incurred for a similar purpose to that for which the endowment had been given by the donor.

Lord MORRISON said this was a matter which would be dealt with by regulations and these could be annulled by either House. The amendment was withdrawn, as was an amendment moved by the Duke of MONTROSE to ensure that the Hospital Endowments Commission would sit in Edinburgh.

The Earl of ELGIN proposed that the powers of the Hospital Endowments Commission should be given for ten years instead of five. This amendment was also negatived.

Regional Boards

On Clause 12 Lord SALTOUN moved to provide that the duty placed upon every regional hospital board to submit a scheme to be exercised by boards of management in the appointment of officers should not apply to a hospital providing facilities for undergraduate and postgraduate clinical teaching. He said the amendment reflected the anxiety of the teaching hospitals that their appointments should remain in their own hands.

Lord MORRISON said the Scottish Bill did not make a sharp distinction between teaching hospitals and non-teaching hospitals. Where a hospital provided facilities for clinical teaching, that was recognized by including on the board of management nominees from the university concerned and from the teaching staff. In the key hospitals which undertook most of the teaching the senior physicians and surgeons were often consultants for areas much wider than those served by the hospitals. The procedure outlined for the appointment of persons to hold clinical posts at a hospital along with teaching posts at a university would not necessarily apply to the most senior appointments—for example, to clinical chairs at universities the holders of which were normally also in clinical charge of hospital wards. Clause 14 was so drafted that these appointments could be excluded from that procedure. The Secretary of State intended to discuss with the universities the arrangements he would make in cases of that kind. The amendment was withdrawn.

On Clause 14 Lord SELKIRK moved that any advisory appointments committee dealing with an appointment involving teaching duties should have equal university and other representation. He said the Bill only gave an assurance that there would be one university representative on the advisory committee.

Lord MORRISON said that the university element on the advisory appointments committee should be in keeping with the relevant importance of the teaching duties as compared with the whole work of the post. He was willing to meet Lord Selkirk to see whether an amendment could be put down later.

Health Centres

On Clause 15, after drafting amendments had been made, Lord SELKIRK moved to provide that a health centre should not be established solely for the provision of general dental services. Lord MORRISON replied that the Secretary of State had assured the dental profession in Scotland that the establishment of a chain of centres providing for dental treatment alone was no part of his plans. In practically every case dental provision would be associated with provision for general medical services. On this assurance the amendment was withdrawn.

On Clause 22 Lord SELKIRK said it seemed that young persons between 16 and 18 were not covered for dental treatment. Lord MORRISON replied that the kind of treatment provided for school-children would not be appropriate for these older boys and girls. The Bill provided a general dental service for the whole population.

Free Choice and Remuneration

Lord SALTOUN moved to vary the wording of Clause 34 so as to provide that regulations might make provision for protecting the right of any person who had complied with the prescribed procedure to choose and change the medical practitioner by whom he was to be attended.

Lord MORRISON said that if the House was anxious for some form of words to be included in the Bill to make it clear that a person could change his doctor a suitable amendment would be devised. The amendment proposed by Lord Saltoun had drafting defects. It was not desirable that a patient should change his doctor frequently.

Lord TWEEDSMUIR moved that regulations should include provision ensuring that the remuneration of general practitioners should be by way of capitation fee subject only to supplementary basic salary as might be prescribed by regulation. He asked whether the basic salary was to be a consolation prize for doctors who did not build up substantial lists of patients or whether it was to be paid to all practitioners at a rate commensurate with present earnings.

Lord MORRISON said it was not proposed by the Government that the salary element should be the main part of the remuneration. The argument in favour of that element was that it would reduce competition for patients and would make it easier for a young doctor to start in practice. It could be increased to attract doctors to under-doctored areas and perhaps also to take account of special experience or qualifications. It was in accord with the proposals put forward by the 1942 Interim Report of the Medical Planning Commission sponsored by the British Medical Association. In replies to the questionary issued to all doctors on behalf of the British Medical Association after the publication of the 1944 White Paper only 23% had favoured straightforward capitation fees. Whether basic salary need be a universal element in remuneration had still to be discussed between the Government and the medical profession. Pending those discussions it was not possible to make any further statement on the subject.

Penal Clauses

On Clause 36 Lord SELKIRK moved to add "provided that no offence shall be committed by a medical practitioner or his personal representative who sells his house by *bona fide* public auction." He submitted that verbal assurances from Ministers on this point might carry no weight.

Lord MORRISON said the amendment was unnecessary. In the House of Commons the Lord Advocate had said he could not conceive of any suggestion of prosecution over a genuine auction where the parties had no prior agreement. On the other hand the sale of a doctor's house at an inflated price might readily lend itself to illegal transactions, and the provision in the amendment would tempt people to make a private arrangement and then to cover it by a public auction. The amendment would enable a coach and horses to be driven through the Bill. Lord SELKIRK pointed out that even if the amendment was accepted the sale of a practice would still be illegal. To "rig" an auction sale would also still remain an offence. Lord MORRISON said the auctioneer would probably not know anything about what happened. The offence might be committed far away from the auction sale. He suggested that Lord Selkirk should consult with legal advisers on whether the words "*bona fide* public auction" were legally watertight and act accordingly on the report stage. On this understanding Lord Selkirk withdrew his amendment and Clause 36 was agreed to. Lord Selkirk also withdrew a further amendment which sought to provide that no admission or statement made at a hearing before an executive council by a person who was the subject of an inquiry should be admissible as evidence before the tribunal. Lord MORRISON said he would consider this point before the report stage.

Lunacy and Mental Deficiency

On Clause 49 Lord MORRISON said a system was envisaged whereby the medical commissioners and also the medical officers employed by the Board of Control would at the same time hold appointments as officers of the Secretary of State. Reports by these medical men of their visits to particular institutions would be both to the Secretary of State and to the Board. In the great majority of cases these reports would be communicated also to the regional board and to the board of management concerned.

After some discussion of Clause 67 and Clause 77 Lord SELKIRK moved to amend the Second Schedule by substituting the Lord President of the Court of Session for the Secretary of State as chairman of the Hospital Endowments Commission. Lord MORRISON resisted the amendment, which was withdrawn.

The Committee Stage concluded.

THIRD READING

On the motion of Lord MORRISON on May 15, drafting amendments were made in Clause 8 to make clear that the purposes to which endowments can be allocated in future by the Commission shall be purposes within the field of the hospital services. Lord Morrison also accepted an amendment proposed by Lord ELGIN making the term of the Endowments Commission seven years instead of five. This was agreed.

On Clause 11 the House accepted an amendment proposed by Lord MORRISON requiring regional hospital boards to have wider consultations than with universities alone in framing schemes for the constitution of boards of management of hospitals or of groups of hospitals.

On Clause 14 Lord LINLITHGOW moved to provide that in any advisory appointments committee the number of persons nominated by regional hospital boards, boards of management, specialists, and universities should comprise half the total number of members. Lord Morrison accepted the amendment, and the House agreed to it. Lord Morrison also accepted an amendment adding research on the development of medical or surgical appliances, including hearing-aids, to the purposes set out in Clause 17.

On Clause 34 Lord Morrison accepted and the House agreed to an amendment which Lord SALTOUN moved. This altered "conferring a right on any person to choose . . . the medical practitioner" into "securing a right to any person to choose and change . . . the medical practitioner." Lord Saltoun hoped that the same privilege would be conferred in the Regulations under the English Bill.

On Clause 43 Lord Morrison accepted and the House agreed to an amendment providing that practitioners should be informed, as soon as may be, of the substance of any charge or complaint.

Lord MORRISON then moved the Third Reading of the Bill and thanked the House for the reception given to it. He said the amendments made improved the Bill. On behalf of Mr. Westwood he gave an assurance that a hospital would not be discontinued until other provision as adequate had been made for the people served by it. He explained that regional hospital boards and boards of management had powers to provide refresher courses for their own employees. It was open to the three executive authorities, the regional hospital board, the local health authority, and the executive council, to take the initiative in proposing arrangements for co-ordinating the services.

Lord Morrison mentioned that Mr. Westwood had received a recommendation from his Medical Advisory Committee that there should be in Scotland a comprehensive laboratory service covering pathology and biochemistry, as well as bacteriology. Mr. Westwood accepted that recommendation and intended to act on it. Clause 18, subsection 2, enabled all the Secretary of State's functions in relation to laboratories to be discharged in a comprehensive service associated with the hospital service. Mr. Westwood did not think that at the inauguration of the new service people employed in the present health services would find themselves without jobs and without compensation. In the new service there would be need of those with knowledge and experience of the existing services. The aim of the Bill was that the Board of Control should continue to be an independent body. Mmbers of the Board would hold their appointments from the Crown. Not all the members of the Board would be officers also of the Secretary of State. Wholly independent persons otherwise unconnected with Government Departments would continue to hold part-time appointments as members of the Board.

The Bill was read a third time and returned to the Commons with amendments.

The amendments made by the House of Lords to the National Health Service (Scotland) Bill were considered by the House of Commons on Tuesday, May 20.

UNIVERSITY EDUCATION

Lord LINDSAY of Birker in the House of Lords on May 14 opened the debate on university education. He said Parliament was committed to a great increase in the university population of England. He urged the Government either to ask the University Grants Committee to appoint a subcommittee to investigate the results of an increase in the number of undergraduates or else to appoint a departmental committee on which the University Grants Committee would be represented. Great changes were imminent in university education in Great Britain as a result of the Butler Education Act. The Butler Act removed the reproach that in England secondary education was confined to a small proportion of the population.

In 1934, one in every 473 of the population of Scotland went to a university; in the United States one in every 125; in England one in every 1,013; and in Wales one in every 741. These proportions were due to historical and social factors and ought to cease. The Barlow Report had recommended that the output of trained scientific graduates in this country must at least be doubled. Then there was the additional demand for professional men, especially for doctors. To have a properly equipped health service the country must have a far greater number of trained doctors, who ought to be university trained and understand what research meant. That involved a great increase in the number of medical undergraduates. Science developed so rapidly that graduates who went in for medicine found their knowledge rapidly becoming out of date. It was well worth while bringing people back to the universities for special courses. Was the university population to be doubled by asking existing institutions to double their number and to preserve their character? The University Grants Committee had asked universities and university colleges how much they

could add to their numbers supposing they were given money for staff and buildings. Their answers added up to 80% of the 100% required. The State would provide the money but building was held up by want of licences and universities were troubled about the question of staff. There were proposals for new institutions from Stoke-on-Trent and from York, Carlisle, Brighton, and other places. No authoritative body had seriously considered these proposals. Should these new institutions be of the existing type? In existing university colleges students took their degrees from the University of London and he was not sure that the obligation to work for the degrees of that University did not fetter the initiative of the smaller institutions.

University Grants Committee

Lord JOWITT, the Lord Chancellor, said he had recently been in touch with the University Grants Committee and knew its outlook. It was a most useful piece of machinery. He conceded that the university population was too small and must be increased as soon as possible. The Barlow Report had recommended that it should be doubled in ten years and it was likely that in the next ten years it would have to be doubled again. In 1938 the country had a university population of something like 50,000. To-day it was something like 66,000, and he hoped that in 1951 it would have reached 88.000. The Chancellor of the Exchequer was prepared to find the money, but the difficulties were in finding teachers of sufficiently high quality and in the building problem. The new terms of reference of the University Grants Committee were: "To assist, in consultation with the universities and other bodies concerned with the preparation and execution of such plans for the development of the universities as may from time to time be required in order to ensure that they are fully adequate to national needs." These were wide terms of reference and the Lord Chancellor did not think it would be wise to appoint another committee.

Lord CHERWELL said the proper function of a university was incompatible with central supervision and control of what was thought and taught. The universities had become very dependent on Government financial support and it was necessary to safeguard their independence. He denied the statement in the Barlow Report that Oxford and Cambridge were unwilling to expand.

Lord BEVERIDGE said the Chancellor of the Exchequer had provided enough money to enable £40,000,000 worth of building to be done at the universities. The universities had gone to the licensing authorities and found that they could have only 50% or even less of what they wanted. There was a real danger if universities were compelled to apply for licences to only regional authorities. Natural scientists had the money they needed for research, but social scientists did not.

Lord SIMON of Wythenshawe said Oxford and Cambridge, London, Edinburgh, and Glasgow were expanding only moderately. The burden was going to fall on the regional universities and colleges.

Lord LINDSAY of Birker withdrew his motion.

Radio-active Substances Bill

Lord ADDISON, speaking on May 12 on the business of the House of Lords, said consultations were still going on concerning the Radio-active Substances Bill. The Government wanted to be able to proceed with this Bill as an agreed measure and was anxious for a little more time. He therefore proposed to postpone the Second Reading which had been set down for the following day. Lord WOOLTON, for the Opposition, concurred.

RIGHTS OF THE SUBJECT BILL

The Preservation of the Rights of the Subject Bill came before the House of Lords on May 15 when Lord READING moved its second reading. He said it was an attempt to safeguard or to restore certain rights of the subject and it had been prepared by the Liberal Party. The Party asked that it should be given a fair chance to find its way to the Statute Book. Its earlier parts were directed to remedying the growing usurpation by the Executive of the powers of Parliament, and the increasing exclusion of the Courts of Law from their supreme function of protecting the individual citizen against excessive encroachments on his right and against abuses of authority. These tendencies had been nurtured by the conditions of two long wars, but there was no reason why they should be perpetuated without being curtailed by reasonable restraints.

Lord SIMON said there was no question of objecting to the process by which Parliament authorized delegation to the proper authorities under proper conditions. The danger was that under the authority so delegated the country might have what were really extra Acts of Parliament. Regulations were sometimes made which were obnoxious and contrary to the public interest. Proper safeguards were required in regard to these things. There was a dangerous tendency to assume in some quarters that a majority in the House of Commons was there simply to register decisions which had been reached by the Government of the day. He welcomed the Bill.

Suppression of Periodicals

Lord LAYTON drew attention to Clause 7 which dealt with the freedom of the Press and the suppression of newspapers. He said the Clause seemed necessary to ensure that freedom of publication was not subject to departmental interference. That issue arose last February. The periodical Press was suddenly brought into contact with a new set of officials. These officials who had never before been in contact with the Press dealt with this issue, although there existed in the Government a department whose officials had been in constant touch with the Press for seven years. The action taken showed the departmental exercise of discrimination between publications. Periodicals were stopped and newspapers were allowed to continue. Subsequently a distinction was drawn between essential newspapers and unessential newspapers. To prevent competition between the periodicals which were suspended and those which were not, the ban was made to include the production of periodicals even though they consumed no fuel at all. This was a ludicrous situation. To stop all devices which enabled the Press to appear was an ominous act. It was subsequently said that the restriction on the Press was by way of an instruction which had no legal validity but that the statutory regulation could have been issued. The grounds on which a statutory regulation could be issued were contained in the Supplies and Services (Transitional Powers) Act. He doubted whether any regulation under that Act could have been issued to impose a restriction on the Press. But if the power existed the case was made out for Clause 7 of the Bill before the House. He noted that periodicals were consuming 29.3% of their pre-war consumption of paper but the Stationery Office and Government Departments were consuming 177%.

The Willesden Case

Lord SAMUEL, speaking on Clause 12, recalled the case at Willesden where the borough council had issued notices of dismissal to medical officers and nurses for the reason that they were not members of particular associations of their profession. There had been an instant public outcry and the borough council withdrew from the position it had taken up. If the council had refused to withdraw and if a number of other local authorities had taken similar action public opinion would not have tolerated this and it would have been suppressed by legislation. When so much pressure was put on the individual that he was compelled against his will to do certain things, economic force was being applied to such a degree that essential human liberty was infringed.

The LORD CHANCELLOR said it was a thoroughly bad principle to dress up a manifesto as a Bill. That was what was being done. The Bill was ill-considered, ill-digested, and ill-drafted. To prevent the Parliamentary machine from breaking down Parliament must have an adequate arrangement for delegating legislation. On Clause 7, which dealt with the suppression of publications, he noted that the Defence Regulations contained no express power now in force to suspend a paper as such but there was power under Regulation 55 to prohibit the production of any article for the purpose of securing a sufficiency of supplies essential to the well-being of the community. If there was an inadequate amount of paper the Government might have to decide for what purpose it was to be used. The Government must continue to have that power under Regulation 55. The particular periodicals which were recently suspended were not dealt with under Regulation 55. The order was made as the result of an understanding reached with the newsprint supply companies and the Periodical Proprietors' Association. The arrangements were made as a result of an understanding reached with those bodies.

Lord LAYTON intervened to say that the newsprint supply companies took no responsibility whatever for suppression. A power of suppression which discriminated between newspapers was not really necessary for regulation purposes. If the Government had approached the Press it would have found a way of economizing fuel without suppressing any specific group of newspapers.

The LORD CHANCELLOR then adversely criticized other Clauses of the Bill. On a division the Bill was read a second time by 37 to 19.

No. 18

INFECTIOUS DISEASES AND VITAL STATISTICS

We print below a summary of Infectious Diseases and Vital Statistics in the British Isles during the week ended May 3.

Figures of Principal Notifiable Diseases for the week and those for the corresponding week last year, for: (a) England and Wales (London included). (b) London (administrative county). (c) Scotland. (d) Eire. (e) Northern Ireland

Figures of Births and Deaths, and of Deaths recorded under each infectious disease, are for: (a) The 126 great towns in England and Wales (including London). (b) London (administrative county). (c) The 16 principal towns in Scotland. (d) The 13 principal towns in Eire. (e) The 10 principal towns in Northern Ireland.

A dash — denotes no cases; a blank space denotes disease not notifiable or no return available.

Disease	1947					1946 (Corresponding Week)				
	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)	(e)
Cerebrospinal fever	52	5	27	1	—	58	10	27	—	1
Deaths		—	2				1	1		
Diphtheria	186	16	40	12	2	367	32	91	34	7
Deaths	2	—	1	1	—	3	—	—	—	—
Dysentery	122	8	13	—	—	212	31	61	—	—
Deaths				—	—				—	—
Encephalitis lethargica, acute	3	1	—	—	—	1	—	1	—	—
Deaths		—					—			
Erysipelas			33	11	1			40	10	6
Deaths		—					—			
Infective enteritis or diarrhoea under 2 years				18					42	
Deaths	73	6	11	7	—	55	4	12	9	3
Measles*	8,442	363	230	45	20	2,711	1056	1059	49	2
Deaths	10	—	1	1	—	3	—	4	—	—
Ophthalmia neonatorum	87	5	13	1	—	98	7	14	—	—
Deaths										
Paratyphoid fever	1	—	—	—	—	6	—	—	—	—
Deaths	—	—	—	—	—	—	—	—	—	—
Pneumonia, influenzal	516	31	5	15	2	610	41	5	3	1
Deaths (from influenza)†	12	2	1	1	—	14	1	2	—	—
Pneumonia, primary			166	19				197	24	
Deaths		31		10	9		39		12	6
Polio-encephalitis, acute	3	—				2	1			
Deaths		—					—			
Poliomyelitis, acute	7	—	1	3	—	3	—	—	3	1
Deaths		—					—			
Puerperal fever		—	7		—		1	21		—
Deaths										
Puerperal pyrexia‡	122	9	7	4	—	168	11	20	1	—
Deaths		—					—			
Relapsing fever	—	—			—	—	—			—
Deaths										
Scarlet fever	873	78	125	24	27	945	65	161	21	32
Deaths	2	—	—	—	—	—	—	—	—	—
Smallpox	1	—	—	—	—	—	—	—	—	—
Deaths				—	—				—	—
Typhoid fever	1	—	2	—	—	5	1	—	—	1
Deaths	—	—	—	—	—	—	—	—	—	—
Typhus fever	—	—	—	—	—	—	—	—	—	—
Deaths				—	—				—	—
Whooping-cough*	2,033	250	255	55	13	2,147	180	137	33	23
Deaths	11	3	—	5	3	13	4	1	2	—
Deaths (0–1 year)	442	51	78	43	17	357	38	64	29	19
Infant mortality rate (per 1,000 live births)										
Deaths (excluding still-births)	4,577	667	645	204	119	4,600	673	591	212	149
Annual death rate (per 1,000 persons living)			13·4	12·9				13·0	13·6	
Live births	9,570	1451	1222	495	274	8,581	1220	1033	471	314
Annual rate per 1,000 persons living			24·6	31·2				20·8	30·2	
Stillbirths	259	47	28			264	34	35		
Rate per 1,000 total births (including stillborn)			22					33		

* Measles and whooping-cough are not notifiable in Scotland, and the returns are therefore an approximation only.

† Includes primary form for England and Wales, London (administrative county), and Northern Ireland.

‡ Includes puerperal fever for England and Wales and Eire.

EPIDEMIOLOGICAL NOTES

Food-poisoning in Coventry

On Wednesday, May 14, 12 cases of suspected food-poisoning were notified to the Coventry public health department. It was quickly confirmed that an article of diet common to all sufferers was from a consignment of "liver sausage" retailed fairly widely throughout the city on Tuesday, May 13. Fresh supplies of this commodity are delivered by the manufacturers to the Coventry area daily. In all cases symptoms were apparent within a few hours of eating the sausage. The illness was characterized by acute abdominal pains, vomiting, profuse watery diarrhoea, and in several cases there were signs of severe shock and collapse. The temperature was of moderate degree, being about 100° F. (37.8° C.) in cases admitted to hospital.

During the day all retailers selling the liver sausage were visited, and several samples were forwarded to the local laboratory for analysis. The manufacturers are withholding distribution of the preparation until further notice. All cases notified were followed up, and by the end of the day some 60 cases in twenty-five households had been discovered. On Thursday, May 15, other cases were notified, and investigation brought to light a further 15 cases in seven households. Reports from the laboratory now showed all samples of the liver sausage to be heavily contaminated with *Staphylococcus aureus.*

There were no fresh notifications on Friday, May 16, but all retailers were visited by inspectors, and following a careful inquiry an additional 27 cases were traced in fourteen households. On May 17 eight delayed notifications were received.

During the four days May 14–17, inclusive, 111 cases were traced, and all had eaten "liver sausage" from the Tuesday consignment. Five patients were removed to the municipal hospital in a state of severe collapse, although it is certain that many of those treated at home by general practitioners were also very severely affected. Fortunately, at the time of going to press no deaths have been reported.

Smallpox

Two further cases of smallpox have appeared in connexion with the outbreak at Bilston. An unvaccinated woman, aged 27, was taken ill on May 9 and developed a scarlatiniform rash on May 12; on May 16 it was recognized that she was suffering from haemorrhagic smallpox and she was removed to hospital, where she died the same day. The source of her infection is at present unknown. At Birmingham a medical student who visited the Bilston smallpox hospital on April 24 and was unsuccessfully revaccinated on the same day has developed a mild attack of smallpox with an atypical eruption.

A case of smallpox was removed to hospital from a Salvation Army hostel in Bermondsey, London, on May 16. This was an unvaccinated man, aged 22, who had come to London from a lodging-house at Barnsley on May 6. His illness began on May 12, and the rash appeared on May 16.

Inquiries at Barnsley revealed that three residents of the lodging-house connected with the Bermondsey case were suffering from smallpox. In two men, aged 72 and 76, the onset appears to have been on May 12, and in a woman, aged 50, on May 15. All three were removed to a smallpox hospital on May 16.

Discussion of Table

In *England and Wales* there were increases in the incidence of measles 480 and dysentery 61 and a decrease in the notifications of acute pneumonia 131.

There were no large fluctuations in the local returns of scarlet fever and whooping-cough. The only change in the incidence of diphtheria was an increase of 12 in Yorkshire West Riding. The increase in cases of measles was due to a sharp rise in a few counties, notably Yorkshire West Riding 243, Glamorganshire 206, Derbyshire 135, and Lancashire 81.

The increase in the notifications of dysentery was confined to Lancashire, where the cases increased from 19 to 76. The principal centres of infection in this county were Prestwich M.B. 32, St. Helens C.B. 18, and Liverpool C.B. 15.

In *Scotland* infectious diseases were less prevalent, and there were falls in the notifications of whooping-cough 67, acute primary pneumonia 65, scarlet fever 25, and diphtheria 10. There were 4 more cases of cerebrospinal fever in the western area.

In *Eire* the only changes of note were decreases in the notifications of whooping-cough 19 and diphtheria 13.

In *Northern Ireland* a fall was recorded in the notifications of measles 16, scarlet fever 15, whooping-cough 7, and diphtheria 7.

Week Ending May 10

The notifications of infectious diseases in England and Wales during the week included: scarlet fever 1,002, whooping-cough 2,222, diphtheria 194, measles 10,134, acute pneumonia 561, cerebrospinal fever 74, dysentery 110, acute poliomyelitis 12, paratyphoid 3, typhoid 6, smallpox 2.

Medical News

The Council of the Society of Medical Officers of Health last week gave a lunch in honour of Dr. George F. Buchan to mark the occasion of his retirement as Medical Officer of Health for Willesden, and the conferment on him of the Honorary Fellowship of the Society. Sir Allen Daley presided. Dr. Buchan was previously President and Treasurer of the Society and has been re-elected Chairman of its Council. At the lunch, Sir Allen Daley, Sir Wilson Jameson, Dr. James Fenton, Sir George Elliston, and Dr. Frank Gray spoke in warm terms of Dr. Buchan as a man who has left his mark on public health.

Dr. H. V. Dicks, Nuffield Professor of Psychiatry at the University of Leeds, will give a talk in the Third Programme on May 26 at 6 p.m. on "German Character Structure."

The last meeting this session of the Scottish Group of the Association of Industrial Medical Officers will be held at the Institute of Hygiene, University of Glasgow, on Wednesday, May 28, at 2.45 p.m., when short papers will be read by Dr. D. M. Watson on "Industrial Sickness Absence," and by Dr. Edward Collier on "Prevention and Control of Industrial Oil Dermatitis." A business meeting will follow.

Sir Stanford Cade will deliver an address on "Recent Advances in the Treatment of Cancer" before the Medico-Chirurgical Society of Anderson's College and St. Mungo's College in the Lister Theatre, Glasgow Royal Infirmary, on Friday, May 30, at 7.30 p.m.

A clinico-pathological demonstration of chronic mastitis will be given in the Meyerstein Lecture Theatre of Westminster Hospital School of Medicine (Horseferry Road, S.W.), on Monday, June 2, at 5 p.m.

The eleventh International Congress of Military Medicine and Pharmacy will be held at Basle on June 2–7. As a result of the successful inter-allied meeting on war surgery held in Paris during the first world war, the first International Congress of Military Medicine met in Brussels in 1921 and founded an international committee. Between then and the second world war this organization held congresses in various parts of the world to study and discuss military medicine, but, whereas between the wars it was relatively easy to communicate across national boundaries, the situation is now much more difficult. In the recent war the countries of Western Europe became intellectually isolated from the combatants, and in addition the world-wide nature of the war raised problems that have not been adequately discussed. This conference will therefore afford an excellent opportunity for the exchange of views on military medicine, and the Secretary-General suggests that a department of medical education should be instituted within the committee, which would co-ordinate and publish together scattered documents on military medicine. His address is Le Général Médecin J. Voncken, Comité International de Médecine et de Pharmacie Militaires, Liége, Belgium.

The first post-war dinner of the Edinburgh University Club of London will be held at the Café Royal on Thursday, June 5, when the Principal, Sir John Fraser, Bt., F.R.C.S.Ed., will be the guest of honour. The Rt. Hon. Sir John Anderson, P.C., M.P., will preside. The annual general meeting will precede the dinner. Any member who has not received his official notice by May 29 is requested to communicate with the honorary secretary at 12, Wimpole Street, London, W.1.

The third Joint Conference of Advisory Councils on Industrial Health was held at Burton-on-Trent on May 22, when the three original bodies, Leeds, Derby, and Burton-on-Trent, were represented. Reports of the year's work by the various councils were given and a discussion took place. At a later session Dr. H. E. Magee (Ministry of Food) opened a discussion on "Nutrition in Industry."

Dr. Donald Paterson, F.R.C.P., who has for some years practised as a paediatrician in London, returned to his home in Canada on May 17. Letters to him should be addressed temporarily: c/o Royal Bank, Vancouver, B.C. Dr. Paterson has been made President of the British Paediatric Association for 1947–8.

Dr. Franklin Kidd, F.R.S., superintendent of the Low Temperature Research Station, has been appointed Director of Food Investigation, Department of Scientific and Industrial Research, from April 1, in succession to Dr. C. S. Hanes, F.R.S.

Any Questions ?

Correspondents should give their names and addresses (not for publication) and include all relevant details in their questions, which should be typed. We publish here a selection of those questions and answers which seem to be of general interest.

Pethidine

Q.—*What are the objections to the continued use of pethidine, so long as clinical improvement is maintained? Does addiction necessarily follow, and what are its signs, symptoms, consequences, and treatment?*

A.—There are no objections to the continued use of pethidine in any given case, apart from the risk of addiction. While this risk exists, the published evidence makes it clear that it is much less than with morphine. Himmelsbach (*J. Pharmacol.*, 1942, **75**, 64) showed that pethidine when given *ad lib.* for ten weeks to previous drug addicts caused a similar dependence to that produced by morphine. On the other hand, Batterman (*Arch. intern. Med.*, 1945, **71**, 345) gave effective clinical doses of pethidine for prolonged periods for relief of pain without encountering any symptoms when the drug was stopped. Excessive doses (100 mg. eight times a day) caused nervousness, irritability, dryness of the mouth, and sleepiness. The symptoms which may occur on withdrawal of the drug are yawning, lacrimation, rhinorrhoea, perspiration, gooseflesh, and dilated pupils. Tolerance does not commonly occur; thus 115 patients receiving 42 to 492 doses of pethidine in 4 to 28 weeks developed no appreciable tolerance to its analgesic action, and it was not necessary to increase the dose as time passed.

Nocturnal Enuresis

Q.—*What can be done for two little girls aged 7 and 3 who suffer from enuresis?*

A.—There are so many causes of bed-wetting—from mental deficiency and physiological causes, like acid urine, to the boy whose sister out of jealousy used to empty the chamber in the bed after he was asleep—that no one remedy can be suggested. The most common cause is latent anxiety, which was so prevalent among evacuated children during the war. It is commonly due to a desire to return to the protection and security of infantile life. As the child gets bigger and more confident it outgrows the anxiety, and the enuresis passes. In other cases it is a form of sensuous gratification, especially in girls because of the proximity of the clitoris. In this type the enuresis ceases when normal sex feelings develop at puberty; but sometimes it may act as a check to such development. Very often it is used as an expression of resentment and of defiance. Other children wet themselves because they like the attention which accompanies it.

What is right treatment for one case is often wrong for another, and for this reason an accurate diagnosis should be made; if necessary the help of a capable child psychiatrist should be secured. Perpetual lifting, worry, and fussing over the child are likely to perpetuate the condition; therefore, in the absence of a correct diagnosis, it is best to let well alone. In some children's homes it was found that putting up a "star" above the bed as a reward was effective; but it may discourage a child who, in spite of the desire for a "star," cannot help wetting the bed.

Chronic Nasal Blush

Q.—*What are the cause and the treatment of a deep red coloration at the end of the nose during a meal or in a hot room in a woman of 39 who is a non-smoker and is abstemious, but who leads an active and worrying life in business? She makes no complaint of indigestion.*

A.—The vasomotor phenomena described in the question are common but ill understood. The red nose of the music-hall comedian bears witness to the popular view of its aetiology. In a related disorder—acne rosacea—evidence has been published suggesting the importance of psychological factors, and the affection has been regarded as analogous to a chronic blush. In the present instance there is clearly a reflex vasodilatation,

the competent stimuli being eating and a raised external temperature. There is no way of abolishing a specific reflex, although sedation will damp down such activity. No method of controlling the effector end of the reflex is known; thus the only rational therapeutic approach is by removing the stimulus. Inquiry should be made to define the stimulus more precisely; it is important to know whether specific foods are responsible. When the adequate stimuli are defined more exactly the patient will have to order her life so as to avoid them as much as possible.

Angina Pectoris

Q.—*A man of 54 has sudden attacks of acute pain in the region of the fourth rib, just left of the sternum, accompanied by transient aching down the left arm followed by numbness. Blood pressure 140/85 mm.; pulse unchanged; no cyanosis or pallor. In the acute stage he has a choking feeling and the mouth is dry. Heart and chest clear on x-ray examination; electrocardiogram normal; Wassermann negative. He has some hypoglycaemia, but prolonged treatment with glucose has been ineffective.*

A.—This history is suggestive of angina pectoris, and knowledge of the factors which precipitate attacks would be of diagnostic value. If they are occasioned by effort, it would be hard to avoid the conclusion that they are anginal. It is stated that the electrocardiogram is "normal"; such a finding does not exclude angina pectoris, but when chest leads are used it is rare to be unable to demonstrate some abnormality. Pain of this type has been described with diaphragmatic hernia, especially of the para-oesophageal variety. It would be worth asking a radiologist to carry out an opaque-meal examination with this possibility in view.

Smoking Habit Cures

Q.—*Are the so-called "smoking habit cures" reasonably effective? What is their nature and have they any ill-effects?*

A.—Smoking habit cures are of all kinds and depend very largely for their success on the desire of the subject to be cured. The principal point in the treatment is to keep the thoughts of the patient off the topic of tobacco and to supply the accustomed stimulus to the mouth in some other manner, as by chewing ginger or gentian. Cures of this kind are at least harmless.

Malaria Recurrences

Q.—*For how many years may a patient who has left the Tropics continue to have recurrences of malaria?*

A.—Falciparum infections are usually short-lived, but attacks of the other types of malaria may recur for a year or two after the primary infection. Quartan infections are the most persistent, and in rare cases recurrences have occurred many years after the initial infection. A fact to be remembered in practice is that many patients who have had malaria may describe symptoms suggesting an attack or they may attribute any malaise to malaria for years after the initial infection, but in the great majority of these cases no parasites are demonstrated. In any case, malaria is now so readily controllable that, properly handled, relapses in this country should prove no real practical disability.

Neonatal Respiration

Q.—*Does gaseous exchange take place in a newborn infant while pulsation continues in the cord? If so, is it advisable to cut the cord in an asphyxiated infant while pulsation is present?*

A.—Once the foetus is born, the uterus retracts so strongly that the circulation in the maternal sinuses is impeded, and it is unlikely that the transfer of much oxygen takes place through the placenta even when the cord is still pulsating. It is this which accounts for the sudden development or increase in anoxaemia, which is the most important stimulus for the onset of respiration, and the very occurrence of asphyxia livida is evidence of cessation of placental function. The value of any delay in cutting the cord is that it enables the child to recover as much as possible of the very considerable proportion of its blood which ordinarily circulates in the vessels of the cord and placenta.

Halitosis

Q.—*A healthy girl suffers from halitosis for which ear-nose-and-throat examination reveals no cause; the condition is improved by alkalis. Will she grow out of it? Is there any objection to taking alkalis indefinitely, or is there some other efficacious treatment?*

A.—Foetor oris is commonly due to dental disease; no mention is made of the state of the teeth and gums. An adequate dental examination is important. The symptom is almost always due to some disorder of the upper respiratory or alimentary tract; its origin is gastric only when there is gross disease of the stomach. Further search for the cause is advisable in this case. Prolonged dosage with alkalis is not without danger; large doses may lead to renal damage.

Facial Hair in a Girl

Q.—*A girl aged 16 is developing a fairly marked growth of hair on her upper lip. Her periods started late and are now scanty and irregular; she is somewhat backward at school. Would hormone treatment have any effect?*

A.—The girl is probably suffering from either overactivity of the adrenal cortex, a masculinizing tumour of the ovary, or pituitary basophilism. The most likely condition is bilateral adrenal cortical hyperplasia, and there may well be a constitutional causal factor as manifested by facial hirsuties in other near relatives. A very full investigation, including hormone assays (for example, an estimation of the excretion of 17-ketosteroids) and possibly pelvic examination under anaesthesia, is indicated before any decision is made as to treatment. No matter what its cause may be, the treatment of facial hirsuties by hormones is usually unsatisfactory. If, however, an androgenic tumour is found and removed, the growth of hair usually ceases.

Calcareous Deposits in Eyelids

Q.—*A patient aged 45, with corrected hypermetropia, suffers from gravel (stones) in the upper eyelids. The lids have been scraped with either a needle or bluestone. Penicillin drops have not helped. Can you recommend any local drops or ointment, or any special diet, to prevent the formation of the stones or, if formed, for dissolving them?*

A.—The cause of deposition of calcareous nodules in the tarsal conjunctiva is unknown. There is no reason to believe that it is connected with refractive errors or with a chronic infective state of the conjunctiva. Neither glasses nor penicillin would, therefore, be of value. Removal of these calcareous nodules by digging them out with the point of a Graefe knife is the only known treatment of any value. Unfortunately recurrences are common, and there is nothing one can do except further surgical removal.

Menopausal Adiposity

Q.—*A woman without other menopausal symptoms has suddenly developed increasing adiposity. Dietary treatment and exercise are without effect. What would you suggest?*

A.—Adiposity may have its onset at the climacteric, and in the view of the writer it is associated with climacteric hyperplasia of the anterior pituitary and adrenal cortex in people of certain endocrine constitution. There is no specific hormone therapy. Modification of the adiposity depends upon diet, thyroid, and mercurial diuretics.

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